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Copper's Statistical Position Strengthens

THE persistently wide margin between production capacity and demand with which copper, lead and zinc in varying degree have been afflicted in recent years, as manifested by the heavy producer stocks overshadowing the market, stems largely from the failure of the United States domestic consumption to recover the ground lost during the recession of 1957-1958, although for the world as a whole consumption has reached new peaks.

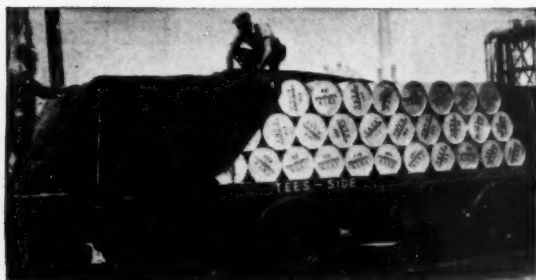
In order to bring supplies into balance, major copper producers in Africa, Chile, the U.S. and Peru have found it expedient to maintain self-imposed cutbacks in production or sales equivalent *in toto* to an annual rate of some 250,000 tons. Lead producers are now supporting the price by cutting down output. Even in the case of zinc, where no general restrictions are in force, U.S. producers have been cutting back output and shipments to the U.K. have been reduced. Despite these restrictions, tin is the only one of the older major metals where demand is patently outstripping supply but for copper in particular the horizon is becoming increasingly bright.

According to the Non-Ferrous Metals Committee of the O.E.E.C. activity in the non-ferrous metals in Europe as a whole should remain in the near future at a level at least as high as that reached by the end of 1960. The Japanese government's ambitious expansion programme, which postulates a rate of growth in the region of 9.2 per cent for 1961 and the two succeeding years, together with the high level of economic aid to developing countries, should be reflected by further gains in the consumption of metals. In this situation it is evident that any significant recovery in the United States economy could have a far-reaching impact on world consumption and demand. In the words of Sir Ronald Prain, it could alter the statistical position of copper "in a few weeks". Better times would also be in store for lead and zinc.

In the past the trend of copper consumption in the U.S. has tended to follow broadly the same curve as that of steel. Particularly encouraging, therefore, is the recent acceleration of the U.S. steel industry's recovery from the recession. Steel mills are now operating at more than two-thirds capacity and in some areas the production rate is in the region of 70 per cent. In conjunction with the new anti-recession measures contemplated by the Kennedy Administration, the upturn in industrial output could conceivably lead to new peaks in U.S. consumption of metals.

The price of copper has already risen appreciably since the beginning of the year. The main factor in this improvement has been the revival of confidence, first in the outlook for American industry and subsequently of metal consumption. Japan, in particular was quick to resume buying for stock the moment it seemed that the copper market was off the bottom and that the price could be expected to rise as the American economy picked up and the production cutbacks took effect. It is, in fact, conceivable that we may be witnessing the beginning of a much bigger stocking movement that is yet realized.

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(Photo C.N.R.)



CYANIDE ODYSSEY

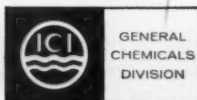


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Even the U.S. Copper Institute's figures for March, which showed that despite the cutbacks announced in October and January, world copper production had risen by 12 per cent to a new record level, have been unable to curb the upward pressure on L.M.E. prices. For most of this month the price has been not less than £240, which many producers regard as the optimum. The remarkable accuracy of the L.M.E.'s assessment of the situation was indicated by the Institute's April figures, which showed a sharp fall in the production of refined copper, both in the U.S. and elsewhere, from the record levels reached in March, together with a rise of approximately 10 per cent in deliveries of copper to fabricators in the U.S., and a decrease of about 6 per cent in Free World copper stocks. Most of the statistical improvement has been in the U.S., where prices have already risen and might well gain further ground.

The question which now arises is how soon other major world copper producers will follow the example set by Kennecott a month ago and return to full production. Mr. Charles R. Cox, retired president of Kennecott and still a director and member of the corporation's executive committee, is on record as stating that he sees no copper surplus this year, and that he has never agreed with the many forecasts during the past year of excess production. On the other hand, as recently as early March, Mr. Robert G. Page, president of Phelps Dodge, in the 1960 pamphlet report to shareholders, expressed doubts as to whether the curtailments so far made would be sufficient to bring production and consumption into balance.

On behalf of Rhodesian Selection Trust, it was said early in May that it would be premature to consider returning to full copper production solely because the price had risen to £240 a ton. More time, it was stated, would be required to study trends in the statistical position of the metal before consideration could be given to reverting to a full production rate, the more so as any premature return to full production could mean a further aggravation of the statistical position of copper and hence increased delay in returning to a balanced position.

R.S.T.'s warning, however, was presumably based to a large extent on the evidence afforded by the Copper Institute's figures for March. The April figures suggest that the statistical position of copper is now fundamentally different from what it was three months ago, and at the same time the outlook for continued improvement in U.S. consumption is becoming increasingly favourable. It would not be surprising, therefore, if Kennecott's example in reverting to full production was followed by other producers, particularly in view of the fact that the supply position during the coming months can by no means be regarded as fully assured. The arrest of M. Tshombe by Col. Mobutu's men and his pending trial have introduced a new factor into the Congo situation and its implications for Katanga's copper industry cannot as yet be clearly discerned. In the United States negotiations will take place this summer between Kennecott's Western Mining Divisions and the two rival unions of copper mine and smelter workers in the West, each Union striving to outdo the other. Failure to reach agreement could lead to a shut-down of one-third of U.S. raw copper production.

The restoration of full production before demand was sufficiently strong to absorb the metal currently being withheld from the market could only result in another setback, just as the tide appeared to be turning in copper's favour, but so, too, could any new threat to the continuity of a comfortable supply position with its adverse effects on consumer sentiment. Bearing in mind that when the tap is turned full on again there will be a considerable timelag before additional supplies can reach the market, the latter

might well be regarded as the greater risk. While opinions may differ as to the immediate outlook, there is general agreement that the long-term prospects for copper, as for all the major non-ferrous metals, are favourable, provided existing markets can be retained and new uses found. The disappointing performance of the American economy as a whole has by no means been solely to blame for the unsatisfactory U.S. consumption figures of recent years. Traditional markets have been invaded by such formidable competitors as aluminium, nickel and plastics, all of which are backed by extremely vigorous research and sales organizations. One example of the effects of the competition is that the average American car now uses only 33 lb. of copper compared with 45 lb. in 1956.

At the same time, American consumers are tending to spend more on "services" and less on "hard goods". As the *Wall Street Journal* put it, "bars, beauty shops and resort hotels are usually crowded. But auto showrooms and new model homes are often so free of customers that the salesmen talk to each other". In this context it is perhaps significant that *per capita* consumption of copper in the United States fell from an average of 18.8 lb. a head to 15.8 lb. per head between 1952 and 1957. In the past four years it may well have fallen farther.

To maintain their present share of the consumer's dollar and of the expanding markets for basic commodities, producers of the older major metals obviously have no alternative but to employ the same weapons which their competitors have found so effective, namely market development and sales promotion based on intensive research programmes to evolve new products and find new uses. Not the least encouraging aspect in the long-term outlook is a growing awareness on the part of producers that the traditional materials can no longer be left to sell themselves.

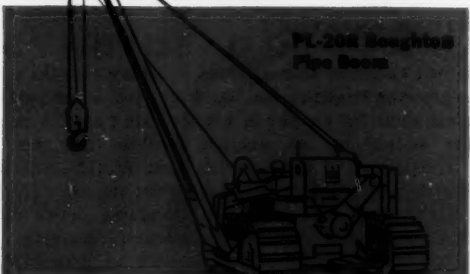
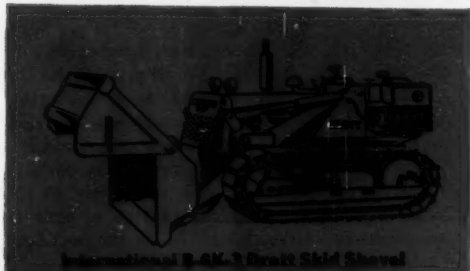
YET ANOTHER SMELTER ?

We have had occasion several times in recent months to refer to the growing tendency for countries that, in the past, have exported their tin output in concentrate form to encourage the setting up of smelters within their own territories, irrespective of the fact that Free World smelter capacity is more than adequate for current needs. This trend is due, of course, to the understandable desire of emergent nations to foster the development of secondary industries by exporting their raw materials in processed form.

Yet, as Sir Ewen Fergusson pointed out in his address to shareholders of The Straits Trading Co. Ltd. (*The Mining Journal*, May 12, 1961, p. 552), the future of tin smelting is closely bound up with that of tin mining. Both will ultimately decline together unless there are discoveries of new areas for mining, of which there are no present indications.

In these circumstances the establishment of additional smelter capacity when current indications point to a substantial decline in output during the next five or ten years seems hard to justify on strictly economic grounds. It is nevertheless understandable that the governments of emergent nations, swayed by political and sociological considerations, should set more store on fostering the establishment of secondary industries by processing their minerals, than on the economic realities of smelter production.

In rather a different category, however, is the new smelter at Port Swettenham with an annual capacity of 12,000 tons, which the Ishihara Sangyo Kaisha company proposes to build in conjunction with a local company. The entire output would be shipped to Japan. As Sir Ewen Fergusson puts it, the Federation of Malaya has ample



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smelting facilities and it is difficult to see what possible benefit can be gained for its economy by the erection of redundant capacity. Charges by the two smelting companies at present operating in Malaya are low enough to make it essential for plants to be kept in efficient condition and for costs to be carefully watched at every stage. If supplies of concentrates were to be diverted to a new and entirely redundant smelter, no additional employment would be created, nor would there be any increase in the aggregate output of smelter tin.

The project is obviously motivated by Japan's policy of seeking to build up assured supplies of basic materials against her rapidly rising needs. So far Japan has had no difficulty in obtaining ample supplies of tin but the proposed smelter could obviously become a valuable asset to her in times when world tin supplies were under pressure, as they may well be in future years. But that is not, one would think, a consideration likely to carry much weight with the Malaysian government.

AUSTRALIAN COAL MINE DENATIONALIZED

An objective of Australian labour policy has always been state ownership of industry, particular targets in recent years being the iron and steel, and the coal industries. The Collinsville coal mine in Queensland is the last remaining state-owned industry in Queensland, and has been worked at a considerable loss, and in recent months the position has been greatly worsened by a series of stoppages. Investment of capital by the government is about £A1,600,000 and accumulated losses are believed to be some £A250,000.

Because of the persistent stoppages and the growing losses, the government gave notice to the employees of its intention to close the mine, and this has now been done. The undertaking, including the associated coke works, was offered to the miners on lease at a rental of one shilling per year, but the unions stated that they were not interested either in leasing or purchasing the mine. The coal mine and the coke works have now been offered for sale by tender.

GUINEA IRON ORE PUZZLE

The government of Guinea has been reported to have granted an important iron ore concession to Consafrique, a consortium of European banks whose main partners are Hambros Bank, the Banque de l'Indochine and the Deutsche Bank. The concession apparently covers deposits in the undeveloped Nimba and Simandou Mountains area near the Liberian border where workable ores are estimated at 250,000,000 tons.

Part of the shareholding in the company formed to extract the iron ore will be held by the Guinea government, as an insurance, it is believed, against the possibility of nationalization. Recently the government nationalized electricity, water, gold and diamonds. Nevertheless, it is understood that the government has given an assurance that the company will have complete independence.

Depending on further investigations by agents of the consortium it is hoped that European steel interests may be sufficiently interested to finance the extraction of the ore. In this connection the British Iron and Steel Federation is in a sense in on the ground floor, if it chooses, since it has a 30 per cent interest in the Compagnie Minière de Conakry that has been working an iron deposit in Guinea for the past seven years, and is, in fact, the only company so far to have exploited Guinean iron ore deposits anywhere. Conakry reserves are said to be of the order of

1,000,000,000 tonnes and production last year amounted to 766,454 tonnes.

So far so good, but Consafrique is not second in the field. According to an announcement last year Kinoshita Shoten, a leading Japanese trading firm, conducted a survey of the Nimba deposits which showed reserves of 25,000,000,000 tonnes. Furthermore, the Guinea-American International Development Corporation has been reported to have a 70 year concession on these deposits, which it has been investigating in association with Kinoshita Shoten and the U.S. Steel Corporation.

This renders the present position a trifle obscure, especially as the estimates of workable ore and of reserves in the same area seem to tally. The situation would be clearer if, as one might suppose, the Guinea-American International Corporation has off-loaded part of its concession to Consafrique so as to spread the financial net.

PENZANCE TIN MINING ENQUIRY

A public enquiry into an application by Mr. W. T. Harry, of Penzance, for planning permission to win and work tin ore and to erect ancillary buildings at Carnellloe, west of Zennor, was held at Penzance last week (see *The Mining Journal*, March 24, p. 325). The application had the support of the Cornish Mining Development Association.

Mr. H. Yeomans conducted the enquiry, which had been authorized by the Minister of Housing and Local Government, because of local agitation against the proposal on the grounds that scenic amenities of the locality in question would be jeopardized. The National Trust was the principal objector represented at the enquiry.

Mr. Douglas Frank, counsel for Mr. Harry, said that the proposed development was in an area designated as one of outstanding beauty. It was proposed to carry out the work in three phases. The first would be purely exploratory, which would involve little in the way of structures. If the exploration bore out Mr. Harry's hopes that the area was worth exploiting, a company would be brought in, as the work would need a considerable amount of capital. Phase two would be the development stage, to prepare the mine itself by excavating a new shaft. This would involve a shaft-head 30 to 40 ft. high. The third phase would be the working of the mine, which would be under the sea. Possibly 200 people would be employed.

Subsequently Mr. Harry told the inspector that the people who were ready to put up the money for the venture would want to be assured that there was at least £1,000,000 worth of tin there, but he refused to reveal whether the interests who were prepared to back him were from the U.K. or overseas.

During the course of the hearings it was stated that the largest owner of mineral rights under National Trust Land in Cornwall was Tehidy Minerals.

Mr. G. E. M. Trinnick, area agent for the National Trust, said the Trust had been in existence for 65 years, and for 62 years in Cornwall. He said that if the application was allowed it would be the most severe setback to their work that they had yet received in that part of the world. It was for them a clear cut case. If permission was granted for Carnellloe, similar project-backers would have a "toe in the door".

Mr. Douglas Frank (representing Mr. Harry) said he had some difficulty in understanding what the National Trust's case was. Everybody, including the National Trust, had paid lip service to the idea of a revival of Cornish tin mining, but in their next breath they clearly implied that, recalling the past, they had little faith in the prospects.

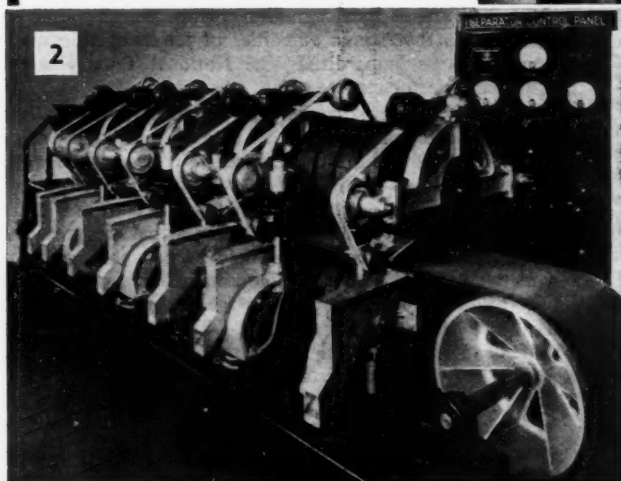
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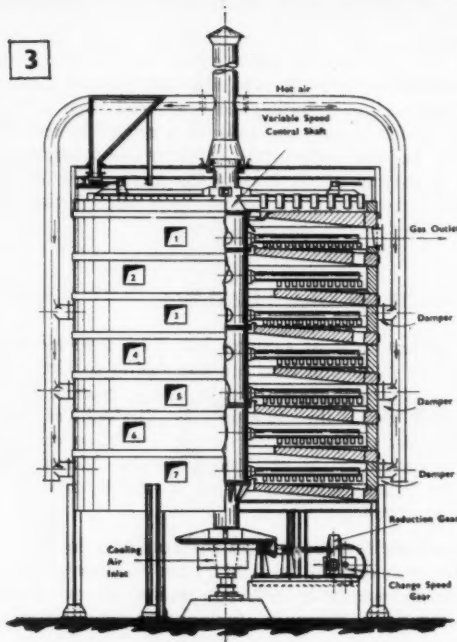
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Is Malaya's Tin Industry on the Decline?

(from our Malayan Correspondent)

TIN consumers are looking to the Federation of Malaya, producer of over one-third of the world's tin, for the answer to their question as to the future adequacy of supplies. The Federation has a stable government and a highly organized and efficient free enterprise tin mining industry. Can Malaya increase her output in the future to offset declining production elsewhere?

In the years up to and including 1941, when tin mining was brought to a halt by the Japanese invasion, the industry in Malaya had shown itself quick to react to world demand. Production was steadily climbing until world over-production caused exports to be restricted in 1931. During that scheme Malaya's standard tonnage assessments were increased from 69,366 in 1931 to 95,474 tons in 1942, representing the assessed output capacity of extant mines. In 1935, on a standard tonnage of 71,940 and an average international release of 63.75 per cent, production in Malaya was 42,359 tons.

In the following year on the same standard tonnage, the release was increased to 92.50 per cent. Mine output responded with 66,729 tons, and in 1937 the response to a raising of the international release to 107.50 per cent took production up to 77,223 tons. In 1938 the standard tonnage was raised to 77,335 tons, but the average release was reduced to 55.64 per cent and output reacted to 43,317 tons. A rise in the release to 76.25 per cent in 1939, produced a rise in output to 46,745 tons. With an average release percentage in 1940 of 115.00 per cent, the mines produced 83,468 tons on a domestic quota allocation of 100.00 per cent. Recorded production came to an end in September 1941 with 62,581 tons for the nine months.

Compared to those figures the response to the lifting of control under the 1953 International Tin Agreement is significantly tardy.

Post-War Output

Post-war output steadily improved up to and including 1956, when the output reached 62,295 tons, but turned downwards in 1957 with 59,293 tons. The standard for assessing permissible export amounts under the current control agreement is 59,503 tons, based on deliveries of tin-in-concentrates to smelters between December 1, 1956 and November 30, 1957. Malaya, over the full control period, December 15, 1957 to September 30, 1960, kept its exports generally in line with the permissible export amounts. The underfill for the whole period was 132.81 tons. In periods of stringent control production was achieved by a greatly reduced number of active mines and large stocks of concentrates were accumulated on the mines.

Now look at the last nine months of control in which the degree was considerably less severe:

	1st 3 months	2nd 3 months	3rd 3 months
1960			
Annual rate of	tons	tons	tons
(a) Permissible exports ...	55,360	56,625	57,300
(b) Production ...	50,024	51,048	52,308

Permissible exports were only filled by delving deeply into the accumulated mine stocks.

In the three months to December 31 production showed some improvement, with an annual rate of 55,536 tons, but in the first quarter of 1961 production ran at the annual rate of 52,568 tons only.

Now let us look at the number of active mines at March 31, 1961 and December 31, 1956:

	Dredges	Gravel Pumping	Other Methods	TOTAL
Dec. 31, 1956 ...	78	633	73	784
Mar. 31, 1961 ...	71	493	46	610

These figures are certainly informative especially in relation to the high production dredges which in 1951 numbered 83, and in 1940, 104.

The percentages of production by the two major methods of mining employed in Malaya in "pointer" years have been:

	Year	Dredging (per cent)	Gravel Pumping (per cent)
Year of all-time record output ...	1940	50.56	33.90
Year of post-war record output ...	1956	49.29	40.03
Year preceding post-war control ...	1957	47.42	41.15
Year of most severe restriction ...	1958	51.72	36.45
Year of easing control and finally suspension	1960	53.88	34.32
First quarter of ...	1961	53.44	33.24

Of the dredges operating at the end of 1956, 91 per cent are back in production but only 76.8 per cent of the gravel pumping mines are working, and a large number of the latter are engaged in short term operations cleaning up pockets of tin left between limestone pinnacles on dredged properties. Although the largest number of dredges operating at any one time since 1945 is 83, there are actually 86 dredges in the Federation of Malaya, of which six had ceased working before the end of 1957 owing to exhaustion of reserves and no fresh land available.

Alluvial Mining

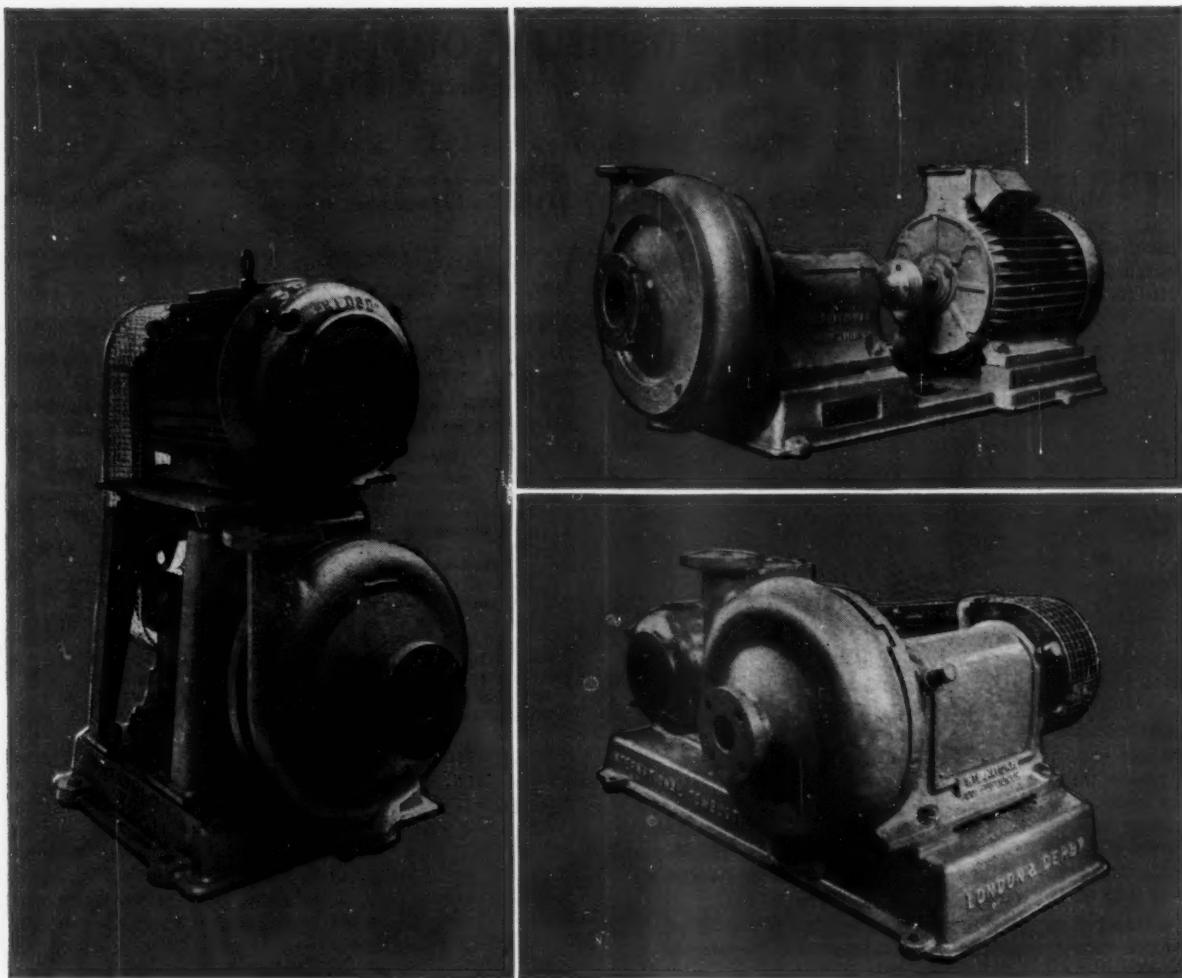
It must be remembered that Malaya's tin mining industry is working almost entirely in alluvial deposits. Currently underground mining accounts for 4.53 per cent of the national output, and most of this is from the large lode mine, one of the largest in the world, in Pahang, which produces over 200 tons of tin a month.

In the alluvial mining field the dredges are the lowest cost producers, but the capital cost of a new dredge, around £1,000,000 with up to an additional £250,000 for camp, workshop, ancillary buildings and equipment including spare parts, and the very nature of their operating, makes it essential that the workable area should be large enough to provide a long term economical programme.

A gravel pump mine, on the other hand, is more expensive to operate in ratio to production but the capital investment is very much less and can be as low as £10,000. Dismantling and removal to another site is relatively inexpensive. The two methods are not competitive.

It is of some significance that dredging is showing a more rapid recovery than gravel pumping, an indication that in Malaya today, with no quotas allocated to individual mines, the low cost producers are increasing their proportionate share of the total output.

From this it may be deducted that dredges generally are working in ground already leased on long term, whilst many of the smaller property gravel pumps, having worked



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out their leases, have no further land to mine. A further deduction is that the average grade of ground now available is of such low tin bearing value that it can only be worked profitably by low-cost producers. Every increase in production costs tends to transfer more low-value ground from the marginal category into the sub-marginal, and so restricts development of gravel pump mining. The imposition in the 1960 Budget of a tax on diesel and heavy fuel oils augmented, by a recent increase in export duty on tin ore, has hit the marginal miners very hard. It is strange that governments of mining countries cannot realize that by taxing production they are impeding maximum development and employment expansion. Transfer the tax from production and put it on profits and the impediment to the development of marginal properties is removed.

Most of the gravel pumping mines are owned and operated by Chinese, whilst all the dredges are owned and operated by companies, European, Australian or American. Chinese miners' leaders and company chairmen have all for many years past urged the State governments to make more land available for mining. The present area allocated for all types of mining is around 2 per cent of the Federation's total surface.

Systematic Prospecting Essential

Relatively little prospecting for tin has been carried out in Malaya during the past thirty years, because first it was discouraged during the pre-war restriction period, secondly the Japanese occupation, thirdly in the immediate post occupation years the emphasis was on rehabilitation, and finally, the closure of the jungle areas to prospecting during the communist terrorist activities which commenced mid-1948. A certain amount of prospecting has been carried out during the past three or four years but it is doubtful if any significant deposits have been discovered which were not known prior to the Japanese occupation.

Haphazard selection of prospecting areas is not sufficient, what is needed, and urgently needed, is a systematic prospecting programme over all areas likely to be tin bearing. Tin mining is a private enterprise industry, the hazards are great and the rewards must be commensurate. Prospecting is a risky financial venture and it cannot be expected that large amounts of capital will be risked unless the prospector is assured that should he be fortunate enough to discover a workable deposit he will be allowed to work it on an economical basis.

An applicant for a prospecting licence, which under the Mining Laws, entitles a successful prospector to a mining lease—on such terms as the State government may decide—will seldom get his licence. He may get a prospecting permit which carries no assurance of a mining lease. He may be required to conduct his prospecting according to a programme and conditions laid down by the State government, and then having spent his capital and time, and eventually found a deposit, on applying for a mining lease he may find that the land containing the deposit has been scheduled for some other purpose. Is it any wonder that there is so much of the country still unexplored? Moreover, the fortunate grantee of a mining lease can only be given a term not exceeding twenty one years with no right of renewal. In practice a renewal may be expected, but perhaps restricted to one year only and also restricted as to the method by which he shall work the property, irrespective of the remaining working life of the lease or the mining programme of the lessee whose capital is at stake.

In these circumstances the tin mining industry in the Federation of Malaya, the world's foremost tin producing country, must decline in the absence of any new deposits being discovered, since many companies are facing

exhaustion of their reserves within the next decade. Improved methods of recovery and treatment may make large tracts of tailings worth re-working. Indeed some dredges are already re-working old tailings, even for the second time.

A few years ago a retiring Chief Inspector of Mines declared that there was remaining in Malaya more tin than had ever been extracted from it but he did not say where it was to be found. In the Paley Report of 1952, Malaya's tin reserves on leased properties at the end of 1950 were estimated to contain 1,500,000 tons of tin. The added remark that no effort had ever been made to appraise unleased areas, remains largely true today. Since that estimate was made some 500,000 tons of tin has been extracted, leaving at the present rate of production somewhat less than 20 years life in known reserves. These reserves are not, of course, equally spread over the various leases, some of which are closely nearing exhaustion, whilst others have remaining lives in excess of thirty or more years. It must, therefore, be assumed that the number of operating mines will tend progressively to decline and that, probably, the number will be reduced to about 50 per cent within the next 15 years, with proportionate long term decline in production. Prognostications of this nature are always dangerous; early in the century it was forecast that Malaya's tin would be exhausted by the 1920's, but the evidence now seems plain for all to see.

There is, however, a very significant factor which must not be overlooked. Although another Kinta Valley is out of the question, well over 90 per cent of the tin mined has been and still is from placer, or alluvial, deposits, and those mainly from the western side of the Main Range. The one great lode mine is on the East side of the Main Range. For many years past mining above 200 feet above sea level has been prohibited because of silting troubles, thus the hills and the Main Range itself, and the Kladang Range of mountains which border on the Kinta Valley, may on investigation disclose large eluvial and even lode deposits *in situ*.

Production Prospects

Returning to the question posed earlier. The answer appears to be that Malaya can be expected to maintain her present rate of production for the next few years but after that a progressive decline in production is to be anticipated, with the important proviso that active encouragement of prospecting and mining may result in new deposits being found for the development of which there is in the country adequate equipment and labour awaiting employment.

The government's Second Five Year Plan 1961-1965 points out that the tin output has not shown any tendency to increase during the 1950's and states that the increase in tin output and employment are likely to be modest during the next few years because of slow growth in world requirements and depletion of the better grades of Malayan deposits. "A rise in output and employment from the 1960 level by 8 per cent or 10 per cent by 1965 appears a reasonable expectation on the basis of production and market considerations" states the Plan on a mildly optimistic note.

The Central Bank of Malaya in its *Annual Report* for 1960 put it rather differently: "Whilst the tin industry may be able to expand its production further in 1961, prospects are such that unless large new deposits of sufficiently high grade ore are discovered and made available for mining and unless the tin price can be expected to remain at an attractive level, annual production is not likely again to reach the pre-restriction output of 59,293 tons in 1957".

Application of Electrical Computing

THERE are two different groups of computers. The one may be called "general computers," the other "special computers". By general computers is meant all those mathematical machines either of the "analogue" (i.e., continuous metering) or the "digital" (i.e., bit counting) variety which can serve to solve a great number of different problems. The special computers are more or less simple apparatus adapted to carry out single repetitive calculations or evaluations for one purpose.

Among the general computers there are three main types to consider:

- (a) Differential analysers of control simulators which may be either digital or analogue computers.
- (b) Network analysers which are analogue computers available in several varieties.
- (c) Digital computers of the well-known class of arithmetical machines capable of solving any problem that can be broken down into more or less elementary steps and which will follow these steps systematically, make logical decisions about the sequence in which steps must be continued, repeated, or alternative routes taken to arrive at the desired solution. Their phenomenal speed of operation and capacity for evaluating a steadily increasing amount of input information are well known.

As it happens, all three of these computers have by now proved to be of value in dealing with problems arising in the field of electrical control and operation of mine winders.

Control Simulator

Since winder control generally involves some complex dynamic problems which in the past had to be solved by more or less rough approximations, it is obvious that a machine which can tighten the precision of forecasting technical performance and can help the designer to foresee the best dimensions of components for optimum control, must be of great value. The difficulties to be met are mainly due to systems involving a considerable number of delay functions, masses to be accelerated, elastic linkages, and non-linearities such as are caused by saturation or other amplitude limitations.

The preferred type of computer for dealing with problems of this kind is an electronic analogue machine, the Control Simulator, based essentially on a suitable interconnection of a series of electronic amplifiers. The most important basic elements of this type of computer are:

- (a) The general purpose amplifier equipped with resistance and capacitance elements which serve as delay function generators, differentiators, and integrators.
- (b) Signal limiting units representing current limits and saturation effects.
- (c) General function generators permitting the introduction of more complex non-linear functions other than signal limiters.

The machine represents a straight amplifier and, ignoring any non-linearities such as those caused by iron saturation, its static characteristic is a straight line expressing the gain in voltage, current, and power if the circuit constants are known. Dynamically, however, the real "transfer function" is more complex due to the delay caused by the magnetic inertia.

Most circuit elements of a complex control system can be introduced in a similar way. In addition there are delays due to masses to be accelerated, stabilizing feedbacks picking up rates of change of system variables, elasticity, and many other features which must be represented. The electronic amplifier is a most versatile tool to simulate the transfer functions of practical control stages of this and other kinds. The electronic simulator not only portrays the relationships between voltages of a given system, but can also portray voltages, currents, torque, and speed by voltages in correspondingly interconnected amplifier stages. The problem and particularly the requirements for stabilization are derived from an expanded circuit which may represent such intermediate quantities as rotor current, liquid controller position, non-linearity of the controller characteristic, rate of change of speed, and so on.

A particularly interesting problem arises in the winder field from requirements of making a modern winder, and particularly an a.c. winder with its inherent limitations of response, satisfy the conditions for automatic operation. This is to make the winder respond to a suitable pattern-speed controller in such a way that the winder can complete the wind with a minimum loss of time.

It is of particular interest to check how a winder having a rather complex response behaves in its approach to the end of the wind under differing conditions of load, and how accurately it can approach the ideal winding cycle within the limits imposed by practical features of a given control system. In problems of this kind the control simulator can be of great help.

Network Analyser

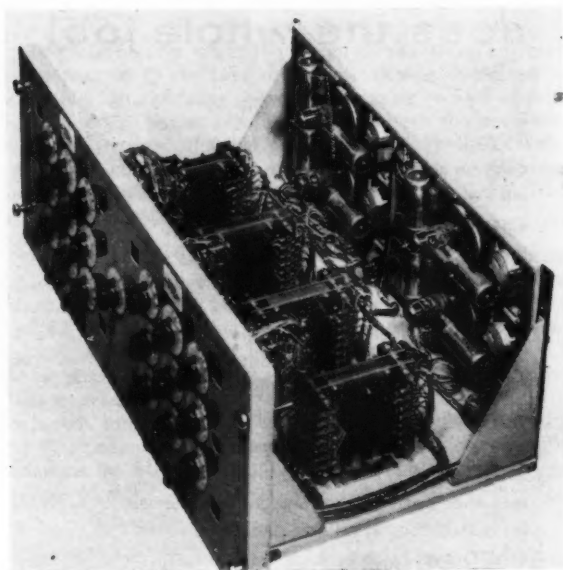
Great care is necessary if the supply for large winders is taken from town networks not connected to large grid systems because of the reaction that the fluctuating power consumption can have on the voltage of the supply system. This applies particularly to rectifier installations which may also call for special attention to the effect of harmonics.

The control simulator



Devices to Mine Winder Problems

The following article comprises extracts of a paper first presented to the Institution of Certificated Mechanical and Electrical Engineers of South Africa by E. Friedlander, of the Engineering Group, Witton, The General Electric Co. Ltd. of England. The article is condensed from "G.E.C. Journal", Vol. 28, No. 1



One double unit of the network analyser

Problems of this kind are, of course, well known and methods of calculation are available. However, modern systems are becoming so complex that it is hardly possible for a planning engineer to foresee all the effects of the fluctuating and distorted load currents on the supply system to which the winder is connected without spending more time on this work than is justified.

Accurate Calculating Unit

Any network analyser will be suitable for this work. However, the G.E.C. decided for a number of technical reasons to install the rather unusual and less well-known transformer type of network analyser. It is believed that this analyser is the most accurate calculating unit of its kind available in the United Kingdom and some problems have already been solved with it for which the conventional analyser has proved to be inadequate.

The metering desk in the centre of the illustration, (top right) provides two metering units, one using conventional instruments, the other using self-balancing bridges to give the results in complex component numbers directly in digital form. All instruments read voltages or products of



The Witton network analyser

voltages. Suitable scales then allow readings to be made in volts, amperes, kW and so on.

The analyser can be used in two groups or can be linked together into one large unit, depending on the type of problem to be investigated. When the analyser is split into two units, one operator will use the scale instruments, the other the digital metering equipment.

Applications in the Winder Field

The permissible voltage dips due to starting of winder motors will still be in the order of only a few per cent particularly when supplied from the distribution system of large towns or under other special conditions. The problem that arises here is one of predetermining accurately a variation of the r.m.s. network voltage due to superimposed load currents of varying phase angle. It is not possible to measure the actual voltage change on a network analyser with the necessary accuracy unless the analyser and its metering equipment are precise. The transformer analyser scores on this count for the reasons given above.

However, a more satisfactory method is to calculate or measure directly the actual change of r.m.s. voltage at any important point in the network. When the voltage fluctuation for the system has been measured, the study is often continued to determine the rating and location of suitable flicker-reduction equipment.

Quite appreciable wave distortions have been found due to conditions of resonance and in particular cable networks fed from transformers whose kVA rating is insufficiently above the capacitive power of the cable can be troublesome. Similarly, large units of power-factor correcting capacitors fed through relatively small transformers can produce resonance effects with consequent unexpected distribution of the harmonic current over a given network, leading possibly to overloading of individual components. This, for instance, may apply to installations connected to the same busbar within a given mining installation where power-factor correcting capacitors are used in conjunction with motors or other underground equipment.

As it is the distribution of the harmonic currents over the network and their possible concentration into single



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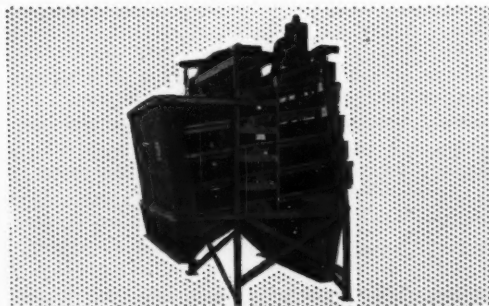
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branches due to resonance absorption that must be watched, a network analyser permitting the injection of these harmonic currents and the study of their course through the maze of a normal system can be invaluable.

Digital Computer

One of the first of the investigations that has to be made on the electrical side when a winder project is under consideration is the shape of the winding cycle diagram which will give the least expensive motor. This means that the acceleration and deceleration periods and the maximum rope velocity can still be varied even when the shaft output, pay load, rope weight, inertia of the mechanical system, drum or pulley diameter, and so on, are already fixed. It may sometimes pay to probe into the choice of some of the basic data such as the payload or the out-of-balance rope weight.

The information which the design or estimating engineer must pass on to the computer department is contained in a simple form such as shown in the table, which is self-explanatory. These data are derived from the specification and from information provided by the mechanical departments concerned with the shaft equipment. R is of course the effective radius of the drum and the layers of rope with single or multi-layer coiling.

In addition to the data input, the computer must receive a programme input which contains all the algebraic calculations necessary and all instructions as to the results required. This is written in the special code of the given computer. With the use of a modern auto-code system such as applies to the Ferranti Mercury Computer, it is no longer necessary to break down the whole process of calculations into the last details. This is done automatically by the computer and the input information actually contains the mathematical steps and symbols in a relatively simple form.

Ripping Uranium in Open Pit

THE problem of how to mine an excess of 50,000 tons of commercial grade ore still remaining in scattered lenticular deposits around the bottom was faced recently at the Jackpile, an open pit uranium mine of the Anaconda Co. on the Laguna Indian Reservation in New Mexico. Blasting for shovel loading was considered uneconomical since this would mean dilution of the commercial grade ore with surrounding low grade and waste material. A further difficulty was that, because of the nature of the deposit, shovel excavation without prior shattering of the material would be extremely slow, if not impossible. The only feasible method was selective mining.

The entire bottom of the pit in those sections where the main ore body had been removed was test drilled on 25 ft. centres to determine the areas where there was still the possibility of profitable operation. Drilling results showed that the deposits generally varied in depth from 2-6 ft., some occupying areas as great as 1,000 sq. ft. on the pit floor. Each was staked and flagged to guide the cleanup team.

The possibility of putting a tractor-mounted ripper to work was suggested, and a test was conducted with a Caterpillar D9 and ripper. As a result of the test, the Anaconda management ordered a Caterpillar D9E tractor with power shift transmission. Attachments included a No. 9 ripper with two teeth and a 9S bulldozer with tilt cylinder to

Data to be given to Computer for Winder Calculation

WINDER No. 522/2 (including duty reference).

$A = 230$ ton/hour (output) positive for raising
 $B = 8.87$ tons (out of balance load) load negative for lowering load

$kB = 10.47$ tons (load including friction)

$T4 = 10$ sec. (decking time)

$s = 5,600$ ft. (shaft depth)

$I = 184,000$ lb. ft./sec.² inertia without motor)

$R = 4.87$ ft. (average radius of rope coiling)

$w = 4.35$ lb./ft. (out of balance rope weight—including coiling effect)

$h = 0.98$ 1/1 (Gear efficiency co-efficient—reciprocal for lowering load)

Calculations using first:

585 lb. ft.

$m = \frac{\quad}{\quad}$ (motor inertia factor)

h.p.

$c = 1$ (deceleration time factor)

(Figures (in italics) correspond to data tape)

The mathematical symbols, steps, and numerical data required are fed to the computer by means of a paper tape which is perforated by a teleprinter, all necessary characters being represented by a suitable code. The auto-code programme is stored permanently on a perforated tape and only the data tape has to be prepared anew for each case.

The results from the computer are obtained on another perforated tape.

Similar output information is obtained for the various conditions of load that may be specified. A comparison of requirements enables the designer almost at a glance to choose the best winding cycle which will satisfy all conditions involved and which will require the least expensive driving motor.

give added prying action in digging out ore chunks in the more heavily consolidated areas. Because of the abrasive nature of the sandstone and the fact that much of the work was against shelf faces, the end bits and plates of the dozer, push arm sides and ripper teeth points were hard-faced for additional wear resistance.

Operational Practice

In operation, the material being mined is first ripped one way, then cross-ripped to break the heavily consolidated ore into easily-handled pieces for shovel loading. It is then bulldozed into a pile from which it is loaded into hauling units with one of the several shovels in use in the pit. Hourly ripping and dozing production varies from 200 to 350 t.p.h., depending on the nature of the deposit being worked. In addition to the cleanup work, the D9E handles haul road maintenance jobs where needed, as mining of the main ore deposit nears an end.

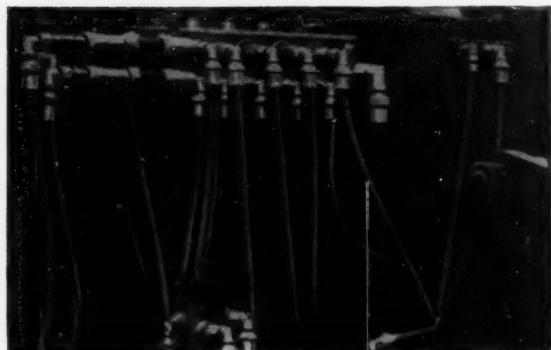
Operated at capacity since October, 1953, the pit has been penetrated to a maximum depth of 440 ft. in the high mesa areas, and to 230 ft. on a majority of the ore body. Overburden, composed mainly of lightly consolidated sandstone, has varied from 160 to 370 ft. in depth. All excavation to reach the uranium ore has been by blasting for loading with shovels.

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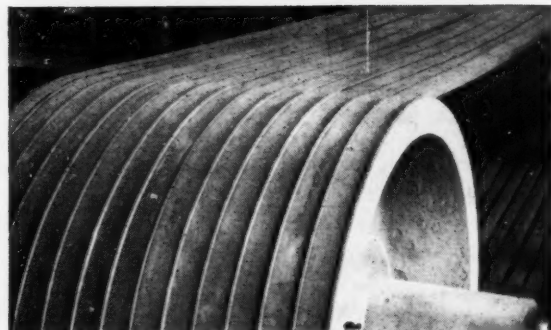


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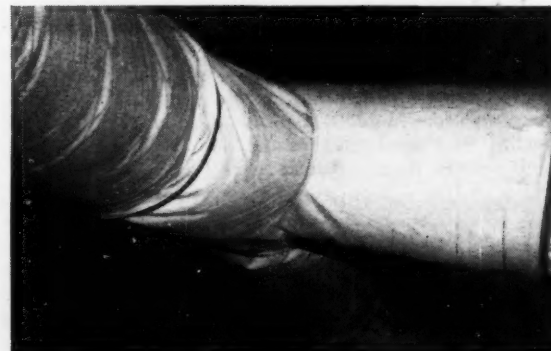
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Mining in the Cameroons in 1960

LAST year the Bureau de Recherches Géologiques et Minières, managers of the Syndicate des Bauxites de Cameroun, continued investigations undertaken in 1959, which were concentrated exclusively on the Minim-Martap. In effect, the atmosphere of insecurity which prevailed throughout almost the whole of the year in the Bamiléké country did not permit the resumption of exploration in the Bangam sector, where further operations are necessary in order to determine the value of the indications given by the operations in 1959.

It is useful to recall the results obtained in the Bamiléké country, namely the delimitation of a bauxite deposit at Fongo-Tongo estimated to contain 40,000,000 tonnes of mineral containing 45 per cent of alumina and 2 per cent silica.

Minim-Martap Deposit

Discovered in 1958 by teams of the Direction des Mines et de la Géologie, this deposit situated 120 km. to the south west of Ngaoundéré could become of great importance to the economic future of the Cameroon; its distance from the sea (about 500 km.) is an unfavourable factor which, however, could be offset to some extent by the realization of the Souala-Tchad railway project.

The deposit is composed of a series of bauxitic plateaux situated near the villages of Minim and Martap, extended in the south by the plains of Ngaoundal. It consists of a superficial bed of about 10 m. average thickness comprising a layer of gibbsite, a ferruginous layer, and a zone of enrichment. The average grade of the mineral is estimated at about 44 per cent aluminium and 2-3 per cent silica. The work carried out by the Direction des Mines et de la Géologie was followed up during 1959 by the Bureau de Recherches Géologiques et Minières. This was mainly concentrated on the Ngaoundal plateau where deposits are estimated at a total of over 100,000,000 tonnes of bauxite with a low silica content of between 1 and 2 per cent.

The programme envisaged for 1961 will be directed for the most part to the Ngaoundal plateau in order to determine by semi-systematic prospecting the exact possibilities of this part of the deposit.

Aluminium:—The Edea works owned jointly by the Cameroons and Pechiney-Ugine, "Alucam", produced 43,940 tonnes of aluminium against 42,315 tonnes in 1959. As in 1959, the seasonal fall in the level of the waters of the Sanaga obliged the company to curtail its operations to some extent thus preventing it from reaching the anticipated output.

Copper:—A mission from the Bureau de Recherches Géologiques et Minières studied indications noted in the sector north west of Caroua. One indication presenting a certain amount of interest was discovered in the Tiffel region. The Bureau de Recherches Géologiques et Minières will concentrate its efforts in this zone with the object of following up this indication and of studying the eventual developments.

Diamonds:—A Bureau de Recherches Géologiques et Minières team studying the sandstone formations of the Méré and the Vina continued its investigations in 1960. The discovery of three gemstones, one of 1.70 carats, constitutes an interesting occurrence situated in the Vina basin. Operations will be carried out in this sector in an attempt to determine the ultimate extent of this occurrence.

Kyanite:—The deposit discovered by teams of the Direction des Mines et de la Géologie in the Edea region

	Production		Exports	
	1959	1960	1959	1960
	tonnes		tonnes	
Aluminium ingot (99.6 per cent) ...	42,315	43,940	44,905	43,300
Gold ...	*30,210	13,703	*26,970	12,440
Cassiterite (66 per cent Sn.) ...	95,100	99,250	120	105
Rutile (95 per cent TiO ₂) ...	—	—	5	24,500
Kyanite ...	—	5	—	5
* kilogrammes				

and investigated by the Bureau de Recherches Géologiques et Minières can be exploited as soon as circumstances permit. Five tonnes were extracted in 1960 and shipped to England for industrial tests.

Tin:—Société des Etains du Cameroun produced 99,250 tonnes of cassiterite in 1960 against 95,100 tonnes in 1959. The company has studied the primary deposit, but the results of its work have been negative. Elsewhere ground work has been undertaken to locate terraces revealed by photogeology. Unfortunately the positions of these terraces could not be located on the ground. The non-payability at depth of the primary deposit and failure to discover the alluvial deposits announced by the photogeological study greatly restrict the life of the deposit.

Iron:—Study of the Kribi deposit was continued by the B.R.G.M., as managers for the Syndicate de Recherches de Fer et de Manganèse au Cameroun, in which the other participant is the High Authority of the European Coal and Steel Community. In 1960, 1,900 m. of boreholes were sunk, bringing to a total of 3,300 m., the drillings executed on the deposit. These operations have delineated the irregular character presented by the massive deposit, which lacks sufficient continuity to permit a reliable indication of its volume.

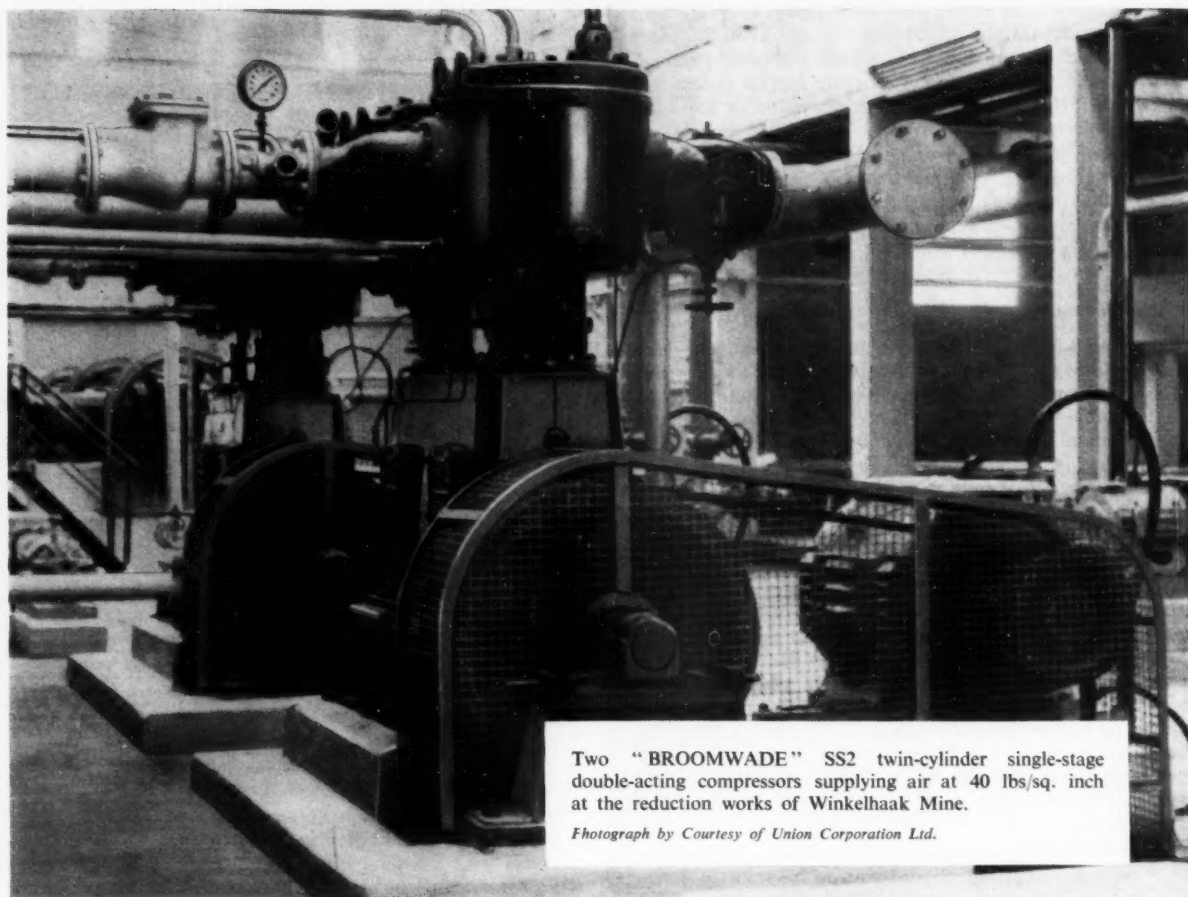
The deposit is estimated at about 150,000,000 tonnes, consisting to a small extent of massive mineral grading 70 per cent Fe., ferruginous quartzites grading 35 per cent, which make up the greater part of the deposit, and a laterite containing 50 per cent Fe. The second stage of exploration having been practically completed on the Mamelles deposit, laboratory studies will be undertaken as well as experimental processing of the mineral on a semi-commercial scale.

Gold:—Production was estimated at 12,940 kg. in 1960, against 30,214 kg. in 1959. This output was largely that of the Compagnie Minière du Cameroun which collects the production of tributaries installed on its concessions. Operations in the Batouri and Bétaré-Oya districts produced only 0.930 kg. following the suspension of operations at SAP Mines, whose output was judged to be unprofitable, and which ceased all activity at the beginning of February 1960.

Geological Mapping and General Prospecting

On account of the ever increasing difficulties of obtaining geological staff with a view to continuation of geological mapping and general prospecting, Cameroon was compelled to entrust these works to contract. It is thus that a working agreement was signed between the Cameroon government and B.R.G.M. to carry out the work relating to mapping on the 500,000 and 200,000 scales, as well as hydro-geological work and general prospecting.

“BROOMWADE” in Winkelhaak Gold Mine



Two “BROOMWADE” SS2 twin-cylinder single-stage double-acting compressors supplying air at 40 lbs/sq. inch at the reduction works of Winkelhaak Mine.

Photograph by Courtesy of Union Corporation Ltd.

At the Winkelhaak Gold Mine in South Africa “BROOMWADE” Type SS2 Air Compressors provide low pressure air for agitation of cyanide tanks used in one of the processes in the reduction works where the gold is separated from the crushed rock.

Each compressor provides 1225 c.f.m. of free air at 40 p.s.i., running at 420 r.p.m.

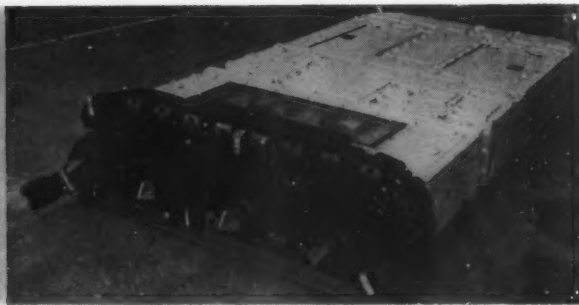
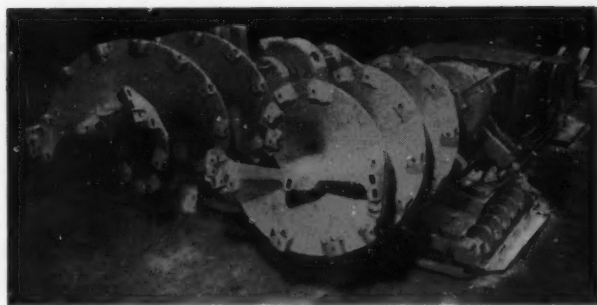
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Machinery and Equipment

Mechanized Thin Seam Mining

An interesting variety of mechanized mining equipment was recently displayed at the opening of Crawley Industrial Products Ltd.'s new factory at Llanelli. (See *M.J.*, May 5, page 513). This opening more or less coincided with the Coal Show at Cleveland, Ohio, where Crawley equipment is being exhibited.

For the past several years, Crawley has been working with U.K. mining engineers on the development of thin seam power loading equipment and one of the results is the application of the National Coal Board's sensing device to the Crawley Midget miner. This represents a considerable step forward towards automatic control of coal cutting machinery. The basic principle of the sensing unit is the measurement of strata density by a gamma ray back scattering technique. At present, the sensing device only records on dials the coal thickness underneath the machine and the operator is responsible for controlling any vertical corrections should these be called for by any deviation of the machine cutting level. It is anticipated, however, that eventually it will be possible to perform the vertical traverse correction automatically, so realizing the concept of fully automatic mining, for long the goal of coal mining engineers.

For many years the company has been producing a wide range of equipment falling into two main categories:

1. Conveying equipment including conveyors and stage loaders;
2. Power loading machinery including the Midget miner for longwall systems and the Crawley Wilcox miner for room and pillar operations.

The Midget miners on view at the plant were the Mark IV and Mark V machines. They indicated the development which has taken place on this machine since it was originally introduced in this country following the decision to base a design of a low seam cutter loader on the Russian UKT 1 low seam power loading machine.

The Mark IV machine on view was a reconditioned unit which has been at work in New Lount Colliery, East Midlands Division, for some two years. The machine consists generally of a British Jeffrey Diamond 75 h.p. cutter motor with haulage end and a midget miner type cutting head and steering mechanism. The unit is fitted with a cutting jib 28 in. high and four 20 in. trepanning arms.

The Mark V machine, which is the latest development of the Midget miner, is a more powerful unit fitted with two 60 h.p. water cooled motors, thus giving a total of 120 h.p. compared with the 75 h.p. of the Mark IV machine. The Mark V machine is controlled by an independent haulage remote from the machine. The machine is fitted with a 20 inch jib and has a power unit with an overall height of 12 in. compared with 16 in. on the Mark IV machine, thus giving it greater seam range. It is estimated that the minimum height in which this machine will work is 18 in.

On both machines it is possible to fit the latest nucleonic sensing device which was originally developed by the Mining Research Establishment on the Midget miner at New Lount Colliery.

The Crawley-Wilcox continuous miner on view is of British design and is suitable for use in seam heights between 28 in. and 46 in. It has been designed to conform to British standard flameproof regulations and is fitted with an Anderson Boyes 16/80 carcass cooled motor. The unit consists generally of two 26 in. diameter augers mounted on swing casings driven from one end of a centrally located electric motor. The haulage is mounted at the other end of the motor and is controlled by means of hydraulically operated clutches. The machine has 12 hydraulic controls which have been grouped to allow easy manipulation by the operator.

The coal is cut by the augers and transferred on to the boom conveyor which passes beneath the power unit of the machine. This boom conveyor is driven by a simple gear type hydraulic motor.

The coal from the boom conveyor is passed to the bridge conveyor which is independently driven by a 7½ h.p. flameproof electric motor. The bridge conveyor is pivot connected to the tail end of the boom conveyor and allows for out-of-line working. The machine is made in various heights with the minimum size being approximately 22 in. The height of working is determined by the size of auger fitted. The unit on view is now soon to be installed at Coppice Colliery in the West Midlands Division.

In addition to these basic coal getting machines, Crawley displayed a comprehensive range of their armoured face conveyors and their haulage equipment. Although of extreme importance in the United Kingdom, the range of power loaders and conveyors manufactured by Crawley are proving of great interest to overseas users. Already there is great interest expressed by the Dutch Collieries. At present Crawley Co. is engaged in organizing its overseas outlets and in considering the best way of marketing its equipment overseas to maintain existing U.K. standards of maintenance and service.

POLISH ROOF-PROPPING

A recent issue of the Polish review *Przegląd Techniczny* describes prototype equipment for mechanical advancing propping designed and built under the auspices of the Bytom Association of the Coal Industry.

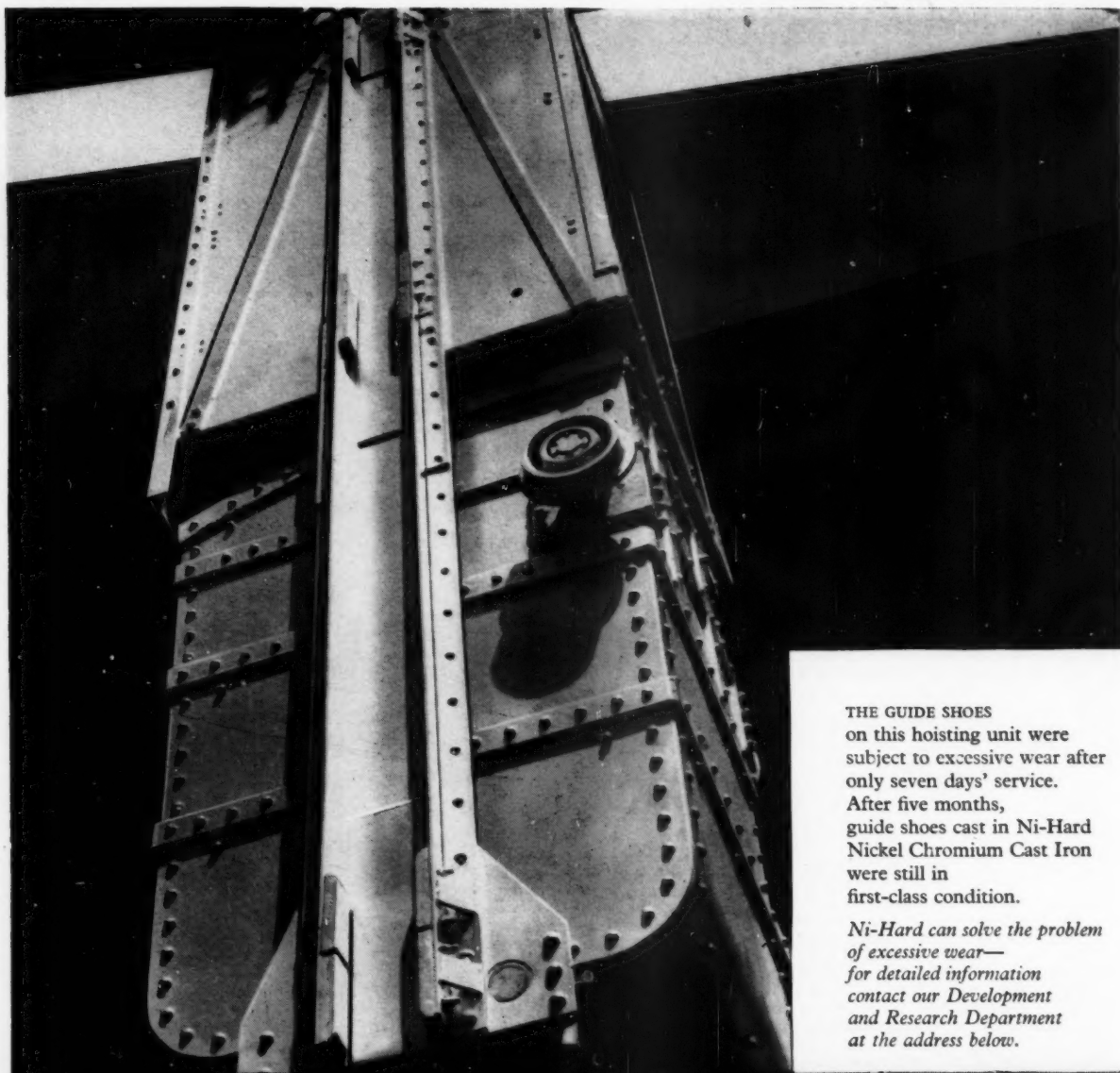
The system is intended for use in horizontal or slightly inclined seams 1,550—2,400 mm. thick, worked by the collapsing wall system, using Slask armoured conveyors and Anderton coal cutting machines or the KBW+2 combine. The propping assembly has two legs, each consisting of a base, three hydraulic props and a roof plate. Between the limbs of each complex is a hydraulic traverser for moving the limbs and the conveyor in the direction of advance.

The first prototype was tried on the surface, and then underground trials were conducted at the Dymitrow colliery, which established that the construction was of adequate strength and functioned efficiently. After six months of intensive work, on January 7 of this year, the first series of 15 sets of hydraulic propping units was handed over for the use at Dymitrow, where it is now working.

The apparatus is said to be an improvement on similar types produced elsewhere. At present similar installations from England are in operation at the Wesola and Zabrze collieries.

The Bytom system claims the added advantage of low cost; the first series of fifteen, plus power supply and spare parts cost 1,500,000 zloty, which represents a saving of 3,000,000 zloty in comparison with imported installations.

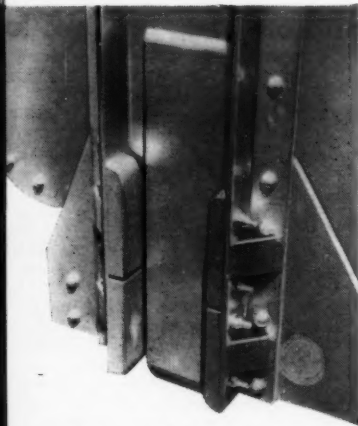
Illustrations on this page shows at left, the Crawley Wilcox miner, and at right, the Mark 4 Midget



Ni-Hard-
white cast iron-
beats abrasion...
in this mine hoisting unit

THE GUIDE SHOES on this hoisting unit were subject to excessive wear after only seven days' service. After five months, guide shoes cast in Ni-Hard Nickel Chromium Cast Iron were still in first-class condition.

*Ni-Hard can solve the problem of excessive wear—
for detailed information
contact our Development
and Research Department
at the address below.*



*Photographs by courtesy of
Wabi Iron Works Ltd, Ontario
show how guide shoes were fitted.*

THE INTERNATIONAL NICKEL COMPANY (MOND) LIMITED, THAMES HOUSE, LONDON SW1



Technical Briefs

New Process for Titanium Strip Production

A new process for producing titanium metal strip by means of cold rolling from raw powder form has been developed. The operation of the process depends on the use of raw powder strip 1 mm. in thickness which is then treated by a series of sintering and rolling operations.

Tests carried out with the material are said to have shown that it has a tensile strength of 67.5 kilogrammes per square millimetre. At the same time it has an elongation of 23.7 per cent. The thickness of the final metal strip produced is of the order of 0.45 mm.

The process is said to be cheap to operate and to enable the titanium metal to be produced in forms which have not hitherto been possible to achieve at a relatively cheap cost.

A new explosion forming technique has been applied by General Electric Co. of New York to titanium, columbium, beryllium copper and stainless steel and is to be applied to tungsten and molybdenum. Instead of chemical explosives, an electric spark is the source of explosive energy—at present, a current build-up of 35,000 volts is used, but this may be taken to 100,000 volts. As with normal explosion-forming, the operation is carried out under water at room temperature.

SYSTEM OF FINE SIZING

Knapp & Bates announce that they are now able to offer the Hartford system of fine sizing. This system, which depends on inducing a fluid state in the material to be handled, represents a new approach to fine sizing technique. It is claimed often to provide successful results in circumstances under which conventional screens show low efficiencies, need too much area or are subject to blinding.

A fluid state can be induced by velocity, by vibration or by passing an upward current of gas, air or liquid through the material being handled. These circumstances favour the separation of particles by gravity means. Sizing down of 100 microns can be achieved, and blinding is eliminated since the aperture diameter is always at least six times the diameter of the particle being separated.

TEST FOR CAESIUM AND RUBIDIUM

A simple field test for detecting caesium and rubidium in rocks, clays, and mineral waters has been developed by the U.S. Bureau of Mines.

Designed for use by prospectors, geologists, and mining engineers, the test requires only a few chemicals and inexpensive equipment. Yet it is capable of detecting caesium and rubidium in quantities as low as 60 parts per 1,000,000. A Bureau technical report, recently placed on sale, explains that the two elements are not scarce, but occur in small amounts in many common minerals. Their chief uses are in minute quantities in infra-red devices such as lamps, telescopes, binoculars and spectrometers; in photoelectric cells, in electronic

vacuum tubes and scintillation counters; and in larger quantities as ingredients in medicines and ceramics.

Prospective new uses, according to the Bureau, include ion-propulsion fuels, plasmas in thermionic converters to change heat to electricity, and heat-transfer media in nuclear power systems.

Report of Investigations 5675, *Field Test for Caesium and Rubidium*, was written by K. C. Dean and I. L. Nichols, Bureau metallurgists of Salt Lake City, Utah. A copy can be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., price 15 c.

NEW ALLOY DEVELOPED

Johnson Matthey & Co. Ltd. announce the development of Mallory 53, a nickel-silicon-copper alloy that fulfils the need for a spring material with mechanical properties at least equal to those of the conventional phosphor bronzes and brasses, but with appreciably higher electrical conductivity.

The need for a spring material with such characteristics has been felt for some time by designers of electrical equipment, especially those involved in the production of miniaturized components.

Because of the exceptionally high electrical conductivity of the alloy, 40-45 per cent I.A.C.S., it is possible for springs of small section to carry appreciably larger currents when made in Mallory 53 alloy than when made in phosphor bronze. Advantage can be taken of this characteristic to increase the current rating of existing designs of springs.

All spring forming operations can be applied to Mallory 53 after heat treatment and hence the alloy is supplied in the precipitation hardened condition requiring no further heat treatment by the user. A data sheet, 1300:332 gives details of the characteristics of the alloy and the forms in which it is supplied.

SELECTIVITY IN COPPER ACTIVATION

It is well known that copper sulphate activates sphalerite and marmatite, and to a certain degree, other minerals, but perhaps its great value is its ability to activate zinc sulphide in preference to other associated minerals, particularly iron sulphides.

Since the activation is due to simple replacement of the zinc in the mineral by copper, one should expect an analogous reaction with pyrrhotite, the thermodynamic driving force being large in both cases and somewhat greater for pyrrhotite. In practice, however, sphalerite is activated preferentially to pyrrhotite, and this appears to be due to acquisition of a protective film of ferric hydroxide on the pyrrhotite which prevents or reduces the copper activation. For such a film to form it is necessary for oxygen to be present and furthermore the pH must be high enough for ferric hydroxide to be extremely insoluble and it has been shown that pyrrhotite abstracts copper freely in the absence of oxygen. Marmatite on the

other hand, abstracts copper both from oxygen free and oxygen saturated solutions, although oxygen reduces the amount of copper abstracted. In the same way the amount of copper abstracted by the marmatite from an oxygen saturated solution decreases as the iron content increases. Although the ferric hydroxide film should become increasingly effective as pH is increased, sulphide ions are released at a pH in excess of 11.2 in the case of pyrrhotite and about 12.2 in the case of sphalerite so that this would be undesirable.

On the other hand, of course, if oxygen were absent, pyrrhotite should respond to activation as indeed it has been shown to do in nitrogen and furthermore floats at a low pH value when the protective film of ferric hydroxide is dissolved. The matter is discussed in *Can. Mng. Met. Bull.* March 1961, Vol. No. 587.

LOW FIRING PORCELAIN ENAMELS

Porcelain enamels for steel with firing temperatures 500 deg. below conventional enamels is the subject of a new 4-page supplement to *Lead in the Ceramic Industries* published by Lead Industries Association. Because these new enamels fire at only 1,000 to 1,100 deg. F. drastic reductions in furnace costs, maintenance and fuel costs are possible. Low firing enamels can also expand product lines. The supplement gives full details on both these points.

Products with complicated shapes which formerly were impossible to coat with conventional porcelain enamels can now be coated with the 1,000 deg. porcelain enamels. The reason is that low firing temperatures reduce distortion problems to negligible levels.

MAGNETIC SEPARATION OF BEACH SANDS

Working on the conducting fractions after high tension separation of beach sand from the Cudgen area of New South Wales, it has been found that the extraction of the magnetic minerals, largely magnetite and ilmenite at 100 deg. to 120 deg. C., was only approximately half that obtained at ambient temperature.

Plotting the extraction values (as percentage of that recovered at ambient temperature — 20 deg. C.) against mineral temperature showed an almost straight line relationship for the minerals of highest susceptibility, falling to 40-45 per cent at 240 deg. C. Minerals of lower susceptibility tended to be affected to a greater extent by initial increases in temperature, but above 60 deg. C., the fall-off in extraction was less, although at 240 deg. C. it had fallen to about 35 per cent of the separation at ambient temperature.

From this work it is obvious that any increase above ambient temperature results in a drop in magnetic extraction efficiency, and it is curious that it has not been noticed before.

The work was reported in *Mining and Chemical Engineering Review*.

MINING MISCELLANY

"Very encouraging results" are reported for a search being carried out for copper on the Chalkidike peninsula of northern Greece by the Greek Institute for Geological Research. The exploration is at the behest of OWA, the Greek Organization for Economic Development. Two foreign experts have now been called in to aid in an intensified search in the area concerned due to be completed in June of this year.

★

The following mineral projects are planned for the Indonesian eight-year economic scheme period ending in 1969: An aluminium refinery with an annual capacity of 18,000 tonnes at Kuala Tanjung, in northern Sumatra; a 12,000-annual tonnes capacity aluminium rolling mill near Djakarta; the opening of small mines to produce copper, sulphur, asbestos, kaolin, quartz and phosphate; the increasing to 500,000 annual tonnes of asphalt on Buton island in the southern Celebes; the raising to 1,500,000 annual tonnes of national coal production; the erection of a coking plant; the building of a 100,000-tonne steelworks at Tjilegon, west Java; the erection of a 30,000-tonne blast furnace at Lampung, south Sumatra; and the building-up of a ferrous metals industry with an annual capacity of 1,000,000 tonnes for Borneo.

★

The Industrial Development Corporation, Greece, in its survey of the zinc industry provides for a unit with an annual output of 15,000 tons of zinc and 15,000 tons of lead. The capital required is estimated at \$11,000,000, including the working capital. The possibility of securing the supply of raw material from various mines in the country is now under consideration. The preliminary survey for the ferro-manganese plant provides for a yearly output of 3,400 tons of ferro-manganese and 1,200 tons of silico-manganese. The technical and economic preliminary survey for the refractory materials plant will be submitted by July 15. The annual report of the I.D.C. further states that a decision has been taken for the participation by 12 per cent in the share capital of the aluminium industry amounting to \$25,000,000 and by 13 per cent in the share capital of Drs.34,500,000 of the Domylika industry.

★

At Shirebrook Colliery, Derbyshire, where a major reorganization scheme is now being undertaken including the opening up of a new coal seam, change-over work at the head of the downcast shaft was completed recently. During the last few months a new reinforced concrete headgear structure rising to 115 ft. has been erected over the existing pithead gear. Work was planned so that the upper section of the old pithead gear could be removed and the winding ropes transferred to the new pulley wheels at a holiday weekend when the shaft would not be in use. A 50-ton capacity lorry-mounted crane, supplied by Mobile Lifting Services Ltd., a member of the Tarmac Group of Companies, was used to ensure that the old equipment could be removed in the short time available. The crane was fitted with a 120 ft. jib.



The 50-ton capacity Tarmac lorry mounted crane, fitted with a 120 ft. jib, lifting old equipment from the inside of the newly constructed pithead at Shirebrook Colliery, Derbyshire

Two mineral deposits, one of copper and one of lead, are reported to have been discovered near Chota Udaipur, in the District of Baroda, India.

★

Test drilling work has indicated deposits of copper, lead and zinc near Kallakurichi in the South Arcot District of India, where a unit of the Geological Survey of India has been conducting tests.

★

Deposits of tungsten, zinc and molybdenum have been discovered in the Nueva Segovia department of Nicaragua, but their extent is not yet known.

★

A manufacturing enterprise sponsored by the Argentine army recently came to an agreement with a mixed consortium of Argentine, U.S. and German interests, to develop iron deposits in the Sierra Gorda mountains in Patagonia; the agreement also covers the eventual construction of a steel mill with initial annual capacity of 100,000 tonnes.

According to figures now issued from Mexico, almost all branches of the country's non-ferrous metal producing industry recorded output increases over last year. Most modest of the increases was in the field of the older major metals, Mexican lead production rising by only 0.7 per cent over the year, from 190,680 tonnes to 191,973 tonnes, and that of zinc by 1.6 per cent, from 263,935 tonnes to 268,227 tonnes, while copper output went up to 6.8 per cent from a 1959 level of 57,274 tonnes to 61,157 tonnes last year. Production of tin and quicksilver each rose by 21.7 per cent over 1960, the former from 383 tonnes to 466 tonnes and the latter from 566 tonnes to 689 tonnes. Bismuth output rose by 7.1 per cent from 239 tonnes to 256 tonnes. Biggest increases were in the production of antimony — of 30.5 per cent from 3,286 tonnes to 4,301 tonnes—and in that of cadmium, which was of as much as 90.2 per cent, bringing production up over the year from 574 tonnes to 1,092 tonnes. Biggest production fall over 1960 was in the field of manganese, where output decreased from 76,935 tonnes to 73,437 tonnes. Output of precious metals was also down on figures for the previous year, by a minimal amount in the case of silver, where it fell from 1,371 tonnes to 1,370 tonnes, and by 1.6 per cent in the case of gold, decreasing from 9,756 kg. to 9,598 kg.

★

It is now understood that reports, put out during February of this year, of a valuable tin deposit in the Antofagasta province of Chile have not been confirmed. The Undersecretary of the Ministry of Mines, Mr. Carlos Pistelli, stated recently in Santiago that the ministry had been unable to get confirmation of the reported discovery and that no claim regarding such a deposit had been lodged.

★

Holman Brothers Ltd., with their subsidiary company Climax Rock Drill and Engineering Co. Ltd. have supplied mining and civil engineering equipment to Russia over a number of years. Both companies, then acting independently, were carrying on a brisk trade with Russia in the early 1930's. The companies are exhibiting at the British Trade Fair in Moscow. Among exhibits are the Holtrac crawler-mounted drill rig, the Rotair 370 portable rotary screw compressor, both the SL.9D and the record-breaking Silver Three drills and the Dryductor rock drill. In the Russian mines the underground temperature is sub-zero. Under these conditions, water passed through the hollow drill steel cannot be used for dust suppression. The Holman Dryductor system is a practical solution to this problem. Finally, the Holman portable sludge pump is displayed.

★

Granby Mining Co. has signed a contract with Sumitomo Shoji Kaisha of Japan, estimated at over \$18,000,000, for 2,000,000 tons of iron ore concentrates from their optioned property in the Queen Charlotte Islands, off the north coast of British Columbia, Canada.

The Benguela Railway Company announce that a concession has been granted by the Portuguese government for the construction of a 40 mile branch line from Robert Williams to Cuima. Robert Williams is 247 miles from the port of Lobito. This branch, to be completed in 1962, will provide a through rail route for exports of iron ore from Cuima, where the Companhia Mineira do Lobito holds a concession from the Portuguese government. Exports of iron ore averaging 65 per cent Fe have risen from 88,357 tonnes in 1957 to 440,071 tonnes in 1960. The Benguela Railway is an Anglo-Portuguese enterprise financed by Tanganyika Concessions.

Goa exported iron and manganese ore, totalling 5,800,000 tonnes in 1960, compared with 3,800,000 tonnes in 1959. Japan was the main buyer, taking 46 per cent; Western Germany bought 39 per cent and Italy 8 per cent.

A new titanium dioxide plant, with a planned annual capacity of 16,000 tons, has started production at Mantyluoto, in Finland, using ilmenite concentrate from the Otanmaki mine and sulphur pyrites from the Harjavalta works. The titanium dioxide will be used for exports and by the Finnish chemical industry.

South Africa is to export 300,000 tons of coal to Burma, for the second year in succession reports the *Rand Daily Mail*. A new contract has been agreed for the export of 70,000 tons of Ceylon, and 50,000 tons of coal have been sold to East Pakistan.

India is reported to have signed contracts for the export of 1,400,000 tonnes of iron ore, shipment to take place during the current year. Of this total, 900,000 are to go to Czechoslovakia, 200,000 tonnes to Rumania, 135,000 to Yugoslavia, and 100,015 to West Germany. Negotiations are continuing for a further export, during the same period, of 2,750,000 tonnes of iron ore, of which 2,000,000 would go to Japan, 300,000 to the U.A.R., 100,000 tonnes each to West Germany, Hungary, Italy and Poland, and 50,000 tonnes to Austria.

The new headquarters building of Bowmaker (Plant) Ltd. stands on a site of approximately 13½ acres. Covered floor space amounting to 91,250 sq. ft. has been erected. The new block of buildings at Watling Street, Cannock, comprises four separate units which are all interconnected. Illustration shows a general view of the spacious workshops

Iron ore output increased in the U.S.S.R. during the first quarter of 1961; production of pig iron was 12,300,000 tonnes (an increase of 8 per cent up on the same quarter of 1960); steel, 17,300,000 tonnes (up 8 per cent); rolled steel, 13,700,000 tonnes (up 8 per cent); steel tubes, 1,600,000 tonnes (up 10 per cent) and iron ore, 27,800,000 tonnes (up 10 per cent).

Union Minière du Haut Katanga have announced from Brussels that their new copper plant at Luilu in the Congo was being brought to the second stage of production, one month ahead of schedule. The plant which has an annual capacity of 100,000 tonnes of copper, will process ores which had hitherto been sent to plants at a greater distance from the mines, no overall increase in the company's copper output being anticipated. Union Minière also announced that a cobalt plant, with an initial capacity of 1,750, and planned future capacity of 3,500 tons, was to be built at Luilu in the near future.

The U.S. Department of the Interior has approved barter arrangements involving 45,000 s.tons of lead from Consolidated Mining and Smelting Co. of Canada. Reports received earlier this month added that a further 45,000 s.tons barter deal involving delivery from an Australian producer was nearing approval. Further deals amounting to between 10,000 and 25,000 s.tons of lead are expected to be arranged shortly.

Prospects of Hungarian financial and technical collaboration in the setting up of an alumina and aluminium plant in India are the subject of recent talks between the two countries. Foreign exchange commitments would be limited, as the proposed plant would be equipped with machinery largely fabricated in India with the help of Hungarian technologists.

Consolidated Mining and Smelting Co. of Canada plans production later this year at its Wedge copper property situated at Bathurst, New Brunswick. Output will be a daily 750 tons. Estimated cost of bringing the project to the production stage is \$2,500,000.

American Metal Climax has been granted an option on Vanadium Corporation's molybdenum properties, located at an altitude of 11,000 ft. on Red Mountain, in Clear Creek County, Colorado. It is expected that American Metal Climax will undertake a drilling programme to re-evaluate the property. The mine, which was purchased by the Vanadium Corporation in 1920 and was worked during the two world wars, has been closed since 1947.

At a recent meeting of Comecon it was agreed that Poland would import over 35,000,000 tonnes of iron ore from Russia during the period ending 1965—almost double the previous rate—while Czechoslovakia would more than double her purchases of Russian iron ore during the same period, by importing 10,100,000 tonnes. Similar rates of increase are reported in the import schedules of Eastern Germany, Hungary and Rumania.

A deposit of iron ore, containing about 160,000,000 tons of hematite assaying 38 to 59 per cent Fe has been discovered on the Nicoya Peninsula in the Province of Guanacaste, Costa Rica.

A booklet entitled *The Golden Helmet* produced by Union Corporation, was presented to the delegates to the Seventh Commonwealth Mining and Metallurgical Congress. It traces the use of gold from early times, and gives current world production and consumption figures.

The Co-operative Minera de la Falda, of Argentina, has bought equipment worth about 100,000,000 pesos from the West German firm, Klockner Industrie-Anlagen. The Banco de Cordoba has guaranteed payment of 20 per cent down, the remainder of the amount to be spread over five years, with 8 per cent interest.

The Yawata Iron and Steel Co. states that leading Japanese steel mills have decided to commence negotiations with the Chinese Metal Export Corporation, for imports of 60,000 tons of coking coal from China. It was believed that imports of coking coal were necessary to promote exports of Japanese steel products to Peking.

A surface gold deposit is reported to have been discovered in the Alto Moluque area of Mozambique.

Continued on page 579



STOP

costs mounting—



START

using *Nylon* conveyor belting

Nylon heavy-duty conveyor belting reduces overall cost per ton carried. Nylon conveyor belting carries coal more efficiently, needs much less inspection and maintenance and has a longer working life. It's logical to change to nylon and start making a saving each working day.

Nylon conveyor belting has extra resistance to impact damage and abrasion of edges, higher tensile strength and energy absorption. It cannot rot, is unaffected by bacteria, is highly flexible, troughs better and allows smaller diameter drums to be used.

Its superiority to conventional belting is being established in all sorts of conditions in British coalmines and elsewhere.

For toughness and durability, there's nothing like nylon re-inforced belting. Ask your regular supplier about it. Also, British Nylon Spinners Limited, as makers of the original nylon yarn, will be pleased to receive enquiries about the use of nylon in conveyor belts. Just get in touch with Industrial Sales, British Nylon Spinners Limited, 68 Knightsbridge, London, S.W.1.

The belt seen working here is a Fenaplast belt running at Havannah Colliery of Northern (N&C) Division. It is fitted to a 30" wide Beaumont Mothergate conveyor which has a 'top and bottom length' of 2,560 yards. It has now been running for more than a year without any fault.

IT'S *Nylon* FOR STRENGTH



A sum of 6,700,000,000 rial is to be spent on industrial and mining development in Persia during the country's new Seven-Year Plan.

Bulgarian mineral production figures for 1960 have now been released in Sofia, and include: 71,000 tonnes of 20 per cent copper concentrate (29 per cent above the figure for 1959); 120,000 tonnes of 70 per cent lead concentrate (+4 per cent); 113,000 tonnes of 52 per cent Zn zinc concentrate (+6 per cent); 14,000 tonnes of electrolytic copper (+54 per cent); 40,000 tonnes of lead (+23 per cent); 17,000 tonnes of zinc (+86 per cent); 17,125 tonnes of coal (+12 per cent); 253,000 tonnes of raw steel (+10 per cent); and 193,000 tonnes of rolled iron and steel.

Sylvinite deposits of some 60,000,000 tonnes and containing 21 per cent pure potassium have been discovered near Pamplona, in Spain. They are to be exploited by the Spanish state-owned mining company ADARO and Patasas de Navarra, a private concern. It is estimated that by 1963, some 50,000 tonnes annually of potash fertilizers will be produced.

The Chinese Nationalist government reports that 22,900,000,000 Taiwan dollars are to be spent on mining under Taiwan's third Four-year Plan, which is the biggest item on the total investment budget of 49,300,000,000 dollars.

The Japanese Ministry of Trade announces that quantitative import restrictions on refined aluminium and silver are planned to be lifted by Japan in June. Similar restrictions on goods including potash and steel products were removed as from April 1 last.

The Anaconda Co. has discovered a 50,000,000 ton copper oxide deposit, with ore averaging 1 per cent Cu near its mine at Chuquicamata in Chile.

Hunting Surveys are conducting a radiometric aerial survey of the Indus Valley, on behalf of the Pakistan Atomic Energy Commission.

The *Metal Bulletin* has published a souvenir issue to mark the occasion of the reconstruction of the London Metal Exchange building. This 84-page, well-illustrated publication, with a foreword by The Rt. Hon. Reginald Maundling, M.P., President of the Board of Trade, traces the growth of the Metal Exchange, and has interesting articles on its progress and prospects; contributions also appear from Dutch, German and U.S. institutions, with similar aims as the L.M.E.

The drilling operations which have been carried out on behalf of the U.K. Atomic Energy Authority on the Solway coast of Kirkcudbrightshire in Scotland have been completed, and no further work in the area is contemplated. The investigations proved the existence of sporadic uranium over a distance of two miles parallel to the coast, extending to a depth of some 200 ft., but the overall ore content proved too small to warrant extension of tests in depth at present.

Company News

Commander and Hill Ltd., public relations consultants of Dudley, Worcs. have been appointed by Nortons—Tivdale Ltd., colliery engineers, to handle press relations in connection with the latter company's exhibit at the American Mining Congress Show at Cleveland, U.S., which opened on May 15.

The Babcock and Wilcox Co. has signed an agency agreement with Aktiebolag Nordstroms Linbanor of Stockholm, Sweden. Under the agreement, the Swedish firm will represent Babcock and Wilcox (U.S.A.) in the sale, erection and servicing of magnesium oxide recovery equipment and in the licensing of magnesium base sulphite pulping processes for pulp mills in Sweden.

A school for training engineers in the use of electronic equipment has been established by Associated Electrical Industries Ltd. at New Parks, Leicester, headquarters of the Electronic Apparatus Division. Trainees include not only members of the Company's Construction Department but also customers' engineers.

The Ore Mining Branch of The United Steel Co.'s Ltd., have awarded a contract of approximately £250,000 to Robert McGregor and Sons Ltd., for the design and construction of road and bridge works at Colsterworth, Lincs. The purpose of this contract is to provide a haulage road 3½ miles long to accommodate 27 cu. yds. dump trucks carrying iron ore from the opencast quarry workings to the rail head.

Telehoist Ltd., of Cheltenham, manufacturers of tipping gears and bodies for commercial vehicles have recently received orders from Iraq, Nigeria and the Portuguese territory of Goa, in India. These include 46 five-ton Ford tipping vehicles for the Iraqi army, 24 seven-ton forward-control Commer tippers for the public works department of the Western Region of Nigeria, and seven Thorneycroft "Big Ben" dump trucks for Goa, where they will supplement an existing fleet of Telehoist-gear trucks used in the iron ore industry.

Wilson Lovatt and Sons has commenced work on the £300,000 Banwen, South Wales, disposal point contract for the National Coal Board Opencast Executive. The work comprises dismantling and re-erection of a washery and screening plant, together with extensive railway sidings, road works and a wagon tippler.

Simon-Carves has received through its Canadian subsidiary, Simon-Carves of Canada, a contract worth nearly £250,000 to supply a coal preparation plant for the Crow's Nest Pass Coal Co., British Columbia. The plant which is capable of cleaning 120 tons per hr. of —½ in. coal, will be ready for commissioning in April, 1962. Participating in the contract is a Simon-Carves subsidiary—the Automatic Coal Cleaning Company, of Carlisle—which will supply the feldspar jig washbox.

The Fraser and Chalmers Engineering Works of The General Electric Co. Ltd., has received an order exceeding £150,000 from the Anglo American Corporation of South Africa Ltd., for two complete double-drum winding engines. They are for the main sub-incline shaft of Bancroft Mines Ltd., Northern Rhodesia, and will be installed in an underground chamber approximately 1,150 ft. below the surface. One of the winding engines will be employed for handling rock and the other will be used for winding men and materials. The mechanical parts of the winders will be identical and will be designed and manufactured at the company's Erith Works. Design and manufacture of the electrical equipment is to be carried out at the company's Witton Works.

The U.S. Bureau of Mines has awarded a \$212,968 contract to Allis-Chalmers Manufacturing Co., Milwaukee, Wis., for reblading a 3,750-h.p. experimental coal-fired gas turbine.

Frederick Parker Ltd. announced recently that a consignment of Parker Plant is on its way from Leicester to Oruro in Bolivia. The plant will enable the Tihua Mines to double its production of ore. This is the first order for plant which the company has secured in Bolivia and it was gained by Parker's agents, Commercial Industrial Boliviana S.A. in the face of severe competition from German and American sources. The order, worth about £10,000 has been shipped in two consignments and comprises two apron feeders, a 16 in. x 10 in. "Rocksizer" crusher, an 18 in. x 14 in. "Rollsizer" roller bearing crushing roll, two belt conveyors 16 in. wide and 100 ft. long and two belt apron feeders, all with control gear. Tihua Mines, Carlos Brain y Cia, operate a tin ore mine and the ore, after its initial preparation is shipped from Antofagasta to the United Kingdom where it is further processed by smelting plants at Hull.

David Brown Industries Ltd. of Huddersfield is contemplating an extension of its gear-manufacturing activities to Wearside. Negotiations are well advanced for the leasing of a factory on the Pallion Trading Estate, Sunderland.

Johns-Manville companies in France and Italy have established two plants to make refractory products for distribution in the European Common Market. Existing structures have been obtained and are now producing refractory products at Niguarda, a suburb of Milan, Italy, and at St. Marcellin, France.

Heyes and Co. Ltd., of Wigan, have received an order from A.E.I. Ltd., for a 5-level Wigan Type 40 shaft signalling indicator system and gate interlocking system for installation at Hucknall No. 2 Colliery. They have also received an order for two Type 3436 locomotive haulage signalling systems for installation at the North-Western Division of the N.C.B. for Agcroft Colliery.

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Metals in Space Travel

When America's first astronaut, Commander Alan B. Shepard, made his successful flight of 290 miles into space, he was housed in a capsule constructed largely of titanium. According to a description published in *The American Metal Market*, the skin of the Mercury's capsule consisted of two layers of pure titanium thin sheet. Other components made of titanium were the stringer structural elements, capsule rings, and the adaptor housing and rings. The metal was supplied by Titanium Metals Corp. of America, who estimate that more than 1,000 tons went into space probe and missile parts last year, about twice the amount used for the applications in 1959. On the outside of the titanium structure was Rene 41, a General Electric proprietary alloy containing iron and many other less common metals.

Titanium was selected for Mercury because it provides the strength of steel at a saving of 44 per cent in weight, coupled with the fact that it retains its strength and rigidity at high temperatures. During re-entry into the earth's atmosphere the structural elements reach 600 deg. F. and the inner walls of the capsule go up to 200 deg. F. The Mercury weighed about 1½ tons.

Twenty titanium capsules have been produced by McDonnell Aircraft Corp. for development of the manned Mercury satellite project under the guidance of the National Aeronautics and Space Administrations.

Beryllium also played some key roles in the capsule, but information on this metal is classified.

Titanium, molybdenum and beryllium alloys have all been experimented with by defence contractors seeking re-entry insulation. Beryllium held the lead for some time, but a few weeks ago it was reported to be meeting competition from other materials as the main shield of an astronaut. Boron and zirconium have been used extensively as alloying agents to increase the stress life of many of the space metals, including nickel-base super alloys.

According to a 154-page report prepared by Battelle Memorial Institute for the Army Missile Agency, lithium-magnesium alloys, 20 per cent lighter than conventional magnesium alloys, are potentially useful in missile and space structures. They appear to be the lightest metals suitable for structural use, some of them weighing only about three-fourths as much as conventional magnesium alloys, half as much as aluminium, and a quarter as much as stainless steel. They could thus provide stiffer structures for less weight, a consideration of critical importance in view of the high rate of booster weight to payload, up to 1,000 lb. of rocket and fuel being required for every pound of payload put into space. Although lithium magnesium alloys do not have a strength of more than about 25,000 p.s.i., they could be valuable in space structures which must be light but need not carry heavy loads.

No information has as yet been released regarding the structural and operational details of the historic Soviet capsule in which an astronaut was

orbited around the earth three times in less than five hours, but outstanding achievements in metals science and technology were unquestionably involved. It is thought that the Russians were probably less intensely concerned with weight-saving as the U.S., because they appear to have fuels with greater thrust for multi-stage firing. Possibly they have superior liquid fuels using metal additives.

While on the subject of Russian space achievements, it is of interest to note that Mr. D. J. Joshi, additional secretary to the government of India and Director-General of Foreign Trade, in addressing the annual meeting of the Mica Export Promotion Council in Calcutta, quoted the Russian Consul General, Mr. Tcherkasov, as telling him that space travel might not have been possible but for mica.

Nuclear power may play a big role in probing outer space. Advocates of nuclear rockets suggest that they might provide a means whereby the U.S. could shorten Russia's lead. Schemes to propel atomic space ships to the moon, Mars and beyond in the coming decades are taking surprisingly specific shape, states *The Wall Street Journal*. On the drawing boards is a seven-man "Hercules" craft said to be capable of making the 70,000,000-mile round-trip to Mars in a little more than a year. Conceivably the first nuclear rocket may come a year or so earlier than the original 1967 target date.

Project Rover, a joint National Aeronautics and Space Administration and A.E.C. project, which is currently the major nuclear rocket effort, has so far cost \$135,000,000 and may eventually cost \$500,000,000 to \$1,000,000,000 more. However, a study by the independent, non-profit making Rand Corp. recently concluded that there was no military need to pour vast sums into an atomic-powered rocket. Meanwhile, scientists are seeking to find materials capable of withstanding the super-high temperatures of nuclear propulsion. It is calculated that a Rover-type nuclear engine would produce a temperature of 3,600 deg. F. Research workers are considering such heat-resistant metals as tungsten, tantalum, columbium, molybdenum and various ceramics for use in Rover hardware.

IMPRESIT WINS VOLTA CONTRACT

The Italian group Impresit which won the big contract for the Kariba Dam in the Central Africa Federation has been awarded a £16,000,000 contract for the construction of the first stage of the Volta River dam project in Ghana.

The overall scheme, estimated to cost some £60,000,000 will provide power for the aluminium smelter for Tema and later for the national electricity grid. Impresit's contract is for the construction of the main dam shoulder and the dam powerhouse. Rock will be used in the construction with a waterproof clay ore in the centre.

Reynolds Metals is understood to be investigating the possibility of setting up a £8,900,000 aluminium plant in Turkey. The Catalgazi and Hirfanli power stations could supply power for production. Initially bauxite would most probably have to be imported from Africa.

ZONE REFINED GERMANIUM

Johnson, Matthey and Co. Ltd. have announced important developments in connection with their work on germanium. Zone-refined germanium is now available, normally in ingots having a nominal weight of 1 kg. A large scrap-recovery plant has been installed which enables a wide variety of types of germanium-bearing residue to be processed. The company wishes to purchase large or small quantities of germanium scrap, and will be pleased to hear from any organization having such material for disposal.

U.S. MANGANESE STOCKPILE

The U.S. government is considering the economic feasibility of converting part of the huge manganese stockpile at Butte, Montana, to meet Federal stockpile requirements for silicomanganese, according to press reports in New York. Presidential Assistant F. G. Dutton, in a communication to Governor D. G. Nutter, stated that, since manganese now in the stockpile was more than sufficient to meet defence requirements, the manganese stored at Butte was in excess of Federal needs.

"Although it does not meet stockpile specifications", he said "there is the possibility that it could be processed as a defence measure to a grade suitable for stockpiling". The value of the manganese in Butte was estimated by the Governor at between \$15,000,000 and \$20,000,000.

Foot Mineral Co. has deferred construction of a \$6,000,000 electrolytic manganese plant at New Johnsonville, Tenn., since, in the opinion of the board expenditure was not justified at the present time in view of the demand for the product. The company already has an annual capacity of 28,000,000 lb. at its two plants in Knoxville.

By contrast the Electrolytic Metal Corporation (Pty.) in which West Rand Consolidated Mines has a minority interest, is to increase its plant capacity so as to double its output of electrolytic manganese. It is claimed that the quality of the product has been well received in world markets and present demand exceeds available supplies.

Mr. S. G. Menell tells shareholders that considerable developments are taking place in the company's mining fields. The South African Railways have extended the existing line northwards from Sishen to Hotazel to pass through the Adams and Devon mines which are supplying ore to Ferralloys Ltd. Private sidings and loading facilities are being constructed at these two mines. The road transport of ore from the Blackrock mine to railhead will be considerably reduced as a result of the extension of this railway line.

The Electricity Supply Commission is extending its supply facilities to the Kuruman and Postmasburg district which will be available to Beeshoek, Gloucester,

Adams and Devon mines. At the Beeshoek iron ore mine a private siding has been completed and a loading plant is in the course of construction. The main loading bin has already been brought into commission.

INTERNATIONAL NICKEL COMPANY CONFERENCE

A four-day conference of 40 representatives in the United Kingdom and overseas of the International Nickel Co. was held at Noordwijk, Holland, last week. This was the first marketing conference of the organization since 1956 and those attending were nickel agents and distributors.

The meeting discussed a world-wide marketing campaign to foster the use of nickel following the opening on March 25 of this year of the new nickel mine in Manitoba. The new mine is now in production and will produce an addi-

tional 75,000,000 lb. of nickel by the end of 1961.

★

The International Nickel Co. has raised the price of copper to Canadian consumers by 1½ c. per lb. The increase to 30.25 (Canadian) c. per lb. delivered Toronto, took effect from May 16.

BRITISH ALUMINIUM EXPANDS

As part of a £10,000,000 expansion programme at the Falkirk rolling mills in Scotland, designed to increase its share of the U.K. market, British Aluminium is to build a hot mill about 172 in. wide, which will be the widest aluminium rolling mill in the world. The new mill will treble Falkirk's present capacity of 50,000 tons per year, and will bring British Aluminium's capacity in the U.K. to well over 200,000 tons. British Aluminium is jointly owned by Reynolds Metals and Tube Investments.

BOOM IN THERMOELECTRIC METALS COMING?

Tellurium, a by-product of some zinc and copper operations, has become one of the components of bismuth telluride and other intermetallics going into electronic cooling devices and also into heat-to-electricity generators. Several metal scientists have indicated recently that a big boom is developing for the thermoelectric metals.

An American firm, Penn Rate Metals Inc., located at Revere, Pa., has recently started commercial production of high purity tellurium, and has also doubled its capacity for producing germanium compounds which brings its output up to 800 kg. per month. These compounds are also used in the manufacture of transistors and other semi-conductor devices.

The company produces a wide range of rare metals including caesium, rubidium metals and salts and other high purity compounds such as cadmium.

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selenide, bismuth, telluride, lead selenide, lead telluride, high purity arsenic, indium and gallium besides tellurium and germanium already mentioned.

Recently the price of tellurium was raised \$1.25 per lb. from \$4.00 to \$5.25 per lb. for the 99.7 per cent commercial grade. The initial action was taken by American Smelting and Refining Co. and then followed by American Metal Climax. Other sellers are expected to follow.

HIGH PURITY METALS

Consolidated Mining and Smelting Co. of Canada is shortly to go into the production of electronics materials at its Spokane plant, Washington, states the company's annual report. The Spokane plant will serve the U.S. market and will be operated by the company's wholly-owned subsidiary Cominco Products Inc.

Cominco's electronic materials plant at Trail, B.C. completed its first full year of operations in 1960. The Trail plant produces a number of very high purity metals and converts them into the various preforms and salts required by the industry. Cominco now includes in its output of electronic materials: antimony, arsenic, bismuth, cadmium, indium, lead, silver, tin, zinc and indium antimonide. Total sales of all such products amounted to over \$1,000,000 last year, about 35 per cent more than in the previous year.

The American Smelting and Refining Co. has also announced commercial production of nine high purity metals—antimony, arsenic, bismuth, cadmium,

gold, indium, selenium, silver and tellurium. The company will also increase output of these electronic metals which are finding increasing use in solid state devices such as rectifiers and cooling units.

ASARCO said it is using a complex series of processes to produce metal of more than 9.999 per cent. It noted that previously such high purity metals had been largely laboratory items.

AUSTRALIAN TUNGSTEN

King Island Scheelite (1947) Ltd. which was mining scheelite by a large open cut, was closed down in August, 1958 because of the unprofitable price of tungsten. Now a new contract has been arranged for a term of two years; the price to be received is related to the open market price and fluctuates with it. Resumption of work by King Island will substantially increase Australian tungsten production.

COLUMBIUM MILL PRODUCTS

The Dupont Co. has announced the start of commercial output of mill products of columbium metal and columbium alloys at its new metal centre in Baltimore (Maryland). Products will include columbium and columbium alloy sheet, strip, plate, bars, tubes and other shapes for metal fabricators. The facility is designed so that tantalum, tungsten and molybdenum can be produced in the future. The price for columbium mill products averages about \$60 a lb.

The metal centre is an outgrowth of

Dupont's expanding development programme in the field of refractory metals, according to Mr. Colin I. Bradford, director of metal products for the pigments department. In alloy form, columbium possesses unusually high strength at high temperatures, Mr. Bradford said. It has applications in rockets, jet engines, nuclear reactors and other "space age" machines, he added.

CHINESE ANTIMONY METAL

Metal circles in London say that United Kingdom buyers are unwilling to pay the much higher price of £186 per tonne for Chinese 99.6 per cent grade c.i.f. It was recently raised to that level from £168 following the £20 per ton increase in the United Kingdom domestic price on April 1.

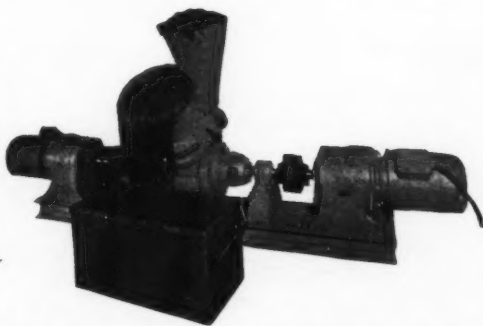
Not only has it been possible to obtain Chinese metal held on the Continent at £182 c.i.f., but metal already in the United Kingdom has changed hands at below the United Kingdom domestically produced delivered price of £230 per ton for the 99 per cent material, after taking into account the 25 per cent import on foreign antimony entering this country and the conversion to a 1-ton basis.

★

The Crucible Steel Co., expects that titanium consumption during 1961 will exceed the 1960 level by about 10 per cent. Crucible's production manager, Mr. Durstein, stated that 85 per cent of U.S. titanium production was for defence purposes, but that the civilian market appeared to be growing.

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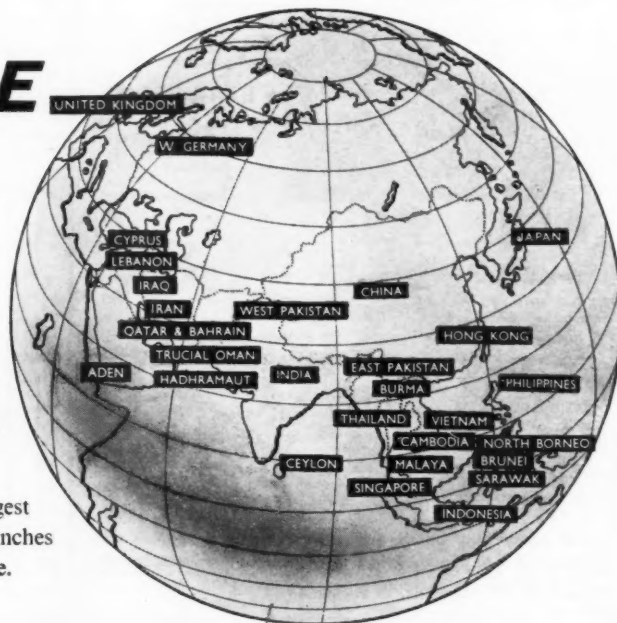
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(From Our London Metal Exchange Correspondent)

The pattern of the last few weeks has once again been repeated in that copper and tin prices have been firm, whilst those for lead and zinc have remained steady or have actually declined.

COPPER LIKELY TO GO HIGHER

The world price structure for copper has again commenced to move upwards, with two of the main American producers and the custom smelters raising their price to 31 c. per lb. It is expected that the remaining American producer will shortly follow suit.

The Belgian price has been raised from the equivalent of about 30 c. per lb. to about 30.62 c. per lb. New York or Antwerp, and rises have also taken place in Canada and Australia.

Informed opinion considers those rises are not the final movements in the present up-swing, as although custom smelters have maintained their intake price for scrap at 26½ c. per lb., even this gives a copper price of 31½ c. per lb. In addition, world demand seems to be picking up and the month's copper figures for April were bullish. These figures (in s.tons) with the corresponding adjusted totals for March in parentheses were:—

Inside the U.S.A.

Shipments (domestic)	125,935	(112,448)
Production refined	128,440	(152,145)
End of month	114,247	(139,274)

Outside the U.S.A.

Shipments

(consumers)	198,835	(207,882)
Production refined	164,886	(187,220)
End of month	333,151	(337,505)

The reduction in stocks in America is probably not as great as it appears, as a considerable part of the shipments was probably the transfer of stocks from producers to consumers. On the London market prices have moved upwards in spite of a considerable amount of profit-taking and additional hedge selling, and although stocks rose by 410 tons to 16,067 the contango failed to increase. It seems to be the general opinion that in London also the price will continue to move up another £10 or so. Yet no one expects a runaway market to develop in view of the fact that one Rhodesian company has been withholding stocks from the market, whilst the other has instituted an actual cut back in production which can be taken off at short notice. At the time of writing, however, a company spokesman is on record as saying that the present situation does not justify such action.

TIN NEARS £880

The tin market continues to occupy the centre of interest now that prices are close to the £880 per ton level, which must be defended by the buffer stock manager. Demand for physical metal has continued at a high rate, while

stocks fell a further 282 tons to 9,334 tons at the beginning of the week. It is expected that further reductions will take place. The point must be imminent at which almost the whole of the stock will be held by the buffer stock manager.

One feature which is still mystifying the market is the maintenance of a contango under these circumstances, but as has been said before this may be due to a steady stream of profit-taking sales as purchases mature. The market will watch very carefully the course of the three months' quotation when the buffer stock manager has to commence selling at £880 per ton cash. The rumour last week that the U.S. had agreed to sell tin held outside its main stockpile has not yet been confirmed, and it now appears that Washington policy has not yet been finalized.

On Thursday the Eastern price was equivalent to £886½ per ton c.i.f. Europe.

LEAD AND ZINC WEAK

The lead and zinc markets have both continued under a certain amount of pressure, and the figures given last week of a slightly better consumption of lead in the U.S. have been nullified by figures which show that in March the production of lead in the States increased 14 per cent above the figure available and that the first quarter's production was as much as 22 per cent over the last quarter of 1960.

Although demand for galvanizing quality zinc has remained good, the stocks of higher grades have at last been reflected in a reduction in the premiums obtainable in Europe and elsewhere. During the week the price of high grade zinc has been reduced by ½ c., whilst that of intermediate grade zinc has been reduced by 30 points. It is felt that this does not foreshadow any reduction in the E. & M.J. quotation for zinc, which remains at 11½ c. per lb.

Lead stocks in the U.K. showed little change with a reduction of 85 tons to a total of 11,879. Zinc stocks, however, continue to increase with a further rise of 354 tons, bringing the total to 6,578 and in view of this it appears that the contango is now firmly established.

OFFICIAL TURNOVERS

Official turnovers (in l.tons) for the week ending May 12, with the previous week's figures in parentheses are:—

Copper	18,425	(25,675)
Tin	2,480	(1,165)
Lead	8,975	(6,425)
Zinc	6,700	(5,575)

Closing prices were as follows:

	May 11		May 18	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£243½	£243½	£244½	£244½
Three months	£243½	£244	£245½	£245½
Settlement		£243½		£244½
LEAD				
Current ½ month	£67½	£67½	£66½	£66½
Three months	£68½	£68½	£67½	£68
TIN				
Cash	£857½	£858	£868	£869
Three months	£863	£863½	£872	£872½
Settlement		£858		£869
ZINC				
Current ½ month	£82½	£82½	£81½	£81½
Three months	£83	£83½	£82½	£82½

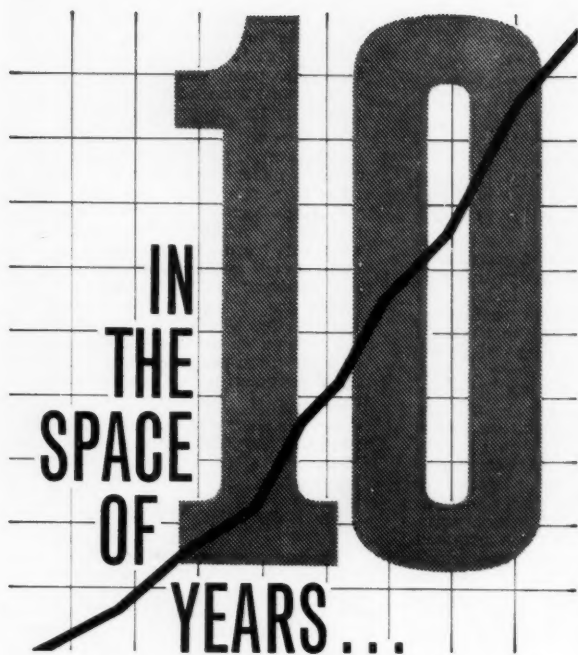
LONDON METAL AND ORE PRICES, MAY 18, 1961
METAL PRICES

Aluminium, 99.5%, £186 per ton	
Antimony—	
English (99%) delivered, 10 cwt. and over £230 per ton	
Arsenic, £400 per ton	
Bismuth (min. 1 ton lots) 16s. lb. nom.	
Cadmium 11s. 0d. lb.	
Cerium (99%) net, £15 0s. lb. delivered U.K.	
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.	
Cobalt, 12s. lb.	
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram	
Gold, 251s. 1d.	
Iridium, £20/£23 oz. nom.	
Lanthanum (98%/99%) 15s. per gram.	

Magnesium, 2s. 2½d./2s. 3d. lb.	
Manganese Metal (96%/98%) £275/£285	
Nickel, 99.5% (home trade) £600 per ton	
Osmium, £18/£22 oz. nom.	
Osmiridium, nom.	
Palladium, imported, £8 12s. 6d.	
Platinum U.K. and Empire Refined £30 5s.	
Imported £28/£28½	
Quicksilver, £67 ex-warehouse	
Rhodium, £43/£45 oz.	
Ruthenium, £14/£16 oz. nom.	
Selenium, 46s. 6d. per lb.	
Silver, 79½d. f. oz. spot and 80d. f.d.	
Tellurium, 37s. 6d. lb.	

ORES AND OXIDES

Antimony Ore (60%) basis	30s. 0d./35s. 0d. per unit c.i.f.
Beryl (min. 10 per cent BeO)	270s./275s. per l. ton unit BeO
Bismuth	65% 8s. 6d. lb. c.i.f.
	18/20% 1s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifabril 48%) (Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
Hard Lumpy 45% (Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
Refractory 40% (Ratio 3 : 1)	£11 0s. 0d. per ton c.i.f.
Small 44% (Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Baluchistan 48% (Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1)	Nb ₂ O ₅ : Ta ₂ O ₅ 165s./167s. 6d. per l. ton unit c.i.f.
Fluorapatite—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 34% Li ₂ O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 34% Li ₂ O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li ₂ O	75s./85s. per ton f.o.b. Beira
Magnetite, ground calcined	£28 0s./£30 0s. d/d
Magnetite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore—	
Europe (46% 48%) basis 60s. 0d. freight	73d./75d. c.i.f. nom.
Manganese Ore (43% 45%)	69d./71d. c.i.f. nom.
Manganese Ore (38% 40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO ₂ (prompt delivery)	£25/£25½ per ton c.i.f. Aust'n
Ilmenite 50/52% TiO ₂	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	119s. 0d./124s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V ₂ O ₅	7s. 6d./8s. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Austrian) 65-66% ZrO ₂	£16 ton c.i.f.



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Mining Finance

Gopeng Writes Up Its Capital

The main news in the preliminary results of Gopeng Consolidated, the big Malayan tin producer, for the year to last September is that a share premium account of £269,135 has arisen from the acquisition of Kinta Tin Mines and Tekka and that it is intended to utilize £191,418 of this in writing up the nominal value of the 3s. 6d. stock units to 5s. This proposal will be considered at an extra-ordinary meeting to be held immediately after the annual meeting on June 22. In the same manner as a share capitalization issue it is a method of bringing the nominal capital, at present £446,643, more into line with that being used in the business. The written up capital will be £638,061 and stockholders will then have one 5s. share for every 3s. 6d. unit currently held.

Gopeng's dividend position is that 2s. 3d. per unit, made up of five interims, has been declared for the year to last September, absorbing £173,852 out of a group net profit of £181,123. For the current financial year the first two interims have totalled 1s. 6d. against only 7½d. by this time last year. Although there was a setback in its ore sales last quarter after the bumper December quarter figure, Gopeng's sales are running well ahead of those for 1959-60 during the whole of which some degree of restriction under the International Tin Agreement was in being. The first six months' figure for the current year is

1,107½ tons which compares with 1,467½ tons for the whole of 1959-60.

The company should still be in the process of reaping the benefits of its absorption of three neighbours over the past two years and it is reasonable to anticipate that dividends for the current year will reach 3s. 9d. or more to give the units at 44s. 9d. a possible potential yield basis of 8.4 per cent which looks a fair enough return in view of the company's good long-term prospects. The units, incidentally have come up from 29s. this year.

CASTS' GOOD DIVIDEND STATEMENT

Consolidated African Selection Trust, which is in the Selection Trust group and which produces diamonds in Sierra Leone and Ghana, has come out with a surprisingly good dividend statement. Firstly, the interim for the year to June 30 is being maintained at 9d. a share on the capital as increased by last year's one for two capitalization issue. Thus the dividend effectively compares with 6d. on the higher capital. Secondly, it is expected that the profits for 1960-61 will permit a final of 2s. 3d. making a total of 3s. for the year which contrasts with an equivalent of 2s. 4d. for 1959-60. The price came up from 14s. 9d. to 16s. 3d. in the two business days preceding the announcement and further improved to

16s. 9d. following it to put the shares on a potential yield basis of over 18 per cent.

As from January 1 last, that is to say for the second half of its current financial year, Casts has, by government order, been selling its Ghana production (largely industrial stones) through the Accra diamond market instead of through De Beers' Central Selling Organization as for many years previously. The implication in the dividend statement is that this new marketing arrangement is working well.

Cast's Sierra Leone output is sold through the C.S.O., although Mr. Harry Oppenheimer revealed only a week ago that a renewal of the five-year contract with Cast's subsidiary, Sierra Leone Selection Trust, which expired at the end of 1960, is still under discussion. It is worth while making the point that this concern's production, which accounts for about a quarter of the country's diamond output, is distinct from the operations of the Sierra Leone Government Diamond Office which is having such a marked success in its efforts to kill the huge smuggling operations that used to go on from the diamond grounds outside Casts' concessions and also to some extent inside them. The Diamond Office sells its stones to De Beers' C.S.O. which last year purchased no less than £10,898,000 worth of stones from this source. This successful fight against smuggling cannot, of course, be other than favourable so far as Casts' own operations are concerned.

WESTERN SELECTION'S CAPITAL REPAYMENT

The Western Selection and Development company is after all going to return to its stockholder part of the money that it will receive from the Ghana government as a result of the recent bids by that government for the capitals of four of the group's gold mines, there, Ariston, Amalgamated Banket, Bremang and Ghana Main Reef. The proposal is that 1s. per 5s. stock unit be returned, thus reducing the nominal value to 4s. The appropriate resolutions will be submitted at the annual meeting to be held on or about June 16 and the repayment will, of course, be subject to Court sanction.

It has not yet been officially revealed exactly how much Western Selection will receive from the Ghana government under the terms of this deal, but the sum is believed to be in the neighbourhood of £700,000. The capital return would absorb £187,500 of this, leaving quite a sizeable amount for re-investment. Here again no official hint has yet been given as to the form this re-investment will take. Presumably the chairman, Mr. C. J. Burns, will enlighten stockholders on this important point either in the report or at the meeting.

Meanwhile, Western Selection has issued its preliminary results for the year to last September, showing a net profit of £165,982 against £133,867 for 1958-59, a result mainly of higher income from dividends and interest. The dividend is again to be 8 per cent which only takes £45,938. There are two special items in the accounts. There is a credit of £265,862 described as a "surplus on valuation of investments". This arises, it is understood, from the Ghana gold holdings being written up to the value represented by the government bids. This write-up and more is used to

London Market Highlights

The ban imposed by the South African Reserve Bank on the use of forward currency dealings to cover share transactions is hardly likely to be a bull point for Kaffirs, although the currency move had relatively little impact on prices this week. It had most effect on the dealers who carry out arbitrage operations between London and Johannesburg. For over a year some of these firms have been in the habit of using the forward exchange dealing facilities in order to protect themselves from currency devaluation risks during the period—it can be as much as two months—between the time shares are sold to the Cape and the actual receipt here of the money for them.

So the new currency move means in effect that the two financial centres will become more separated. Since most of the demand, such as it is, these days comes from South African buyers, prices in Johannesburg may draw ahead of those in London where sellers tend to predominate. But if the price margin between the two centres reaches anything near to 10 per cent, this would be sufficient for arbitrageurs to discount any possible devaluation risks. There were signs of the gap widening on Wednesday when in a dull London market losses of 1s 10½d. occurred in Western Holdings at 106s. 10½d. and Free State Geduld at 83s. 9d. compared with respective prices of 108s. 6d. and 84s. 6d. at the Cape.

Finance issues stayed dull, Anglo American falling 3s. 9d. to 117s. 6d. and Union Corporation relapsing to 42s. 6d.

In the diamond group some Swiss selling reappeared in De Beers, the price of which promptly reacted 3s. 9d. to 116s. 3d. One of the few bright spots was provided by Consolidated African Selection Trust where buyers scented the coming higher dividend news and the shares jumped 1s. 9d. to 17s. at one time: at their current price of 16s. 7½d. they are on a potential yield basis of 18.6 per cent.

Copper shares failed to attract much attention even though the metal price showed fresh firmness both here and in the United States. Chartered, in fact, were distinctly dull with a loss on the three days of 2s. to the lowest this year of 58s. 6d.; no especial reason for the continued weakness emerged other than the presumption that there has been a large seller about recently. A fall of 1s. 6d. to 22s. in Tanganyika Concessions reflected some apprehension about the imminent interim dividend caused by the reported hold-up in payment of the Union Minière final for 1960.

The recent strong Eastern demand for tin shares waned and so despite a buoyant metal price, share values occasionally lost ground when London buyers decided to take profits. A particularly dull market developed in Siamese Tin which came back 1s. 3d. to 17s. 9d. following news that the Kota Bahru dredge, which produces about one quarter of the company's production, is out of action for the time being owing to a damaged bucket ladder.

Rand and Orange Free State Returns for April

GOLD OUTPUT AND PROFIT

Company	April 1961				Current Financial Year			Last Financial Year		
	Tons (000)	Yield (oz.)	Profit† (£000)	Year ends	Tons (000)	Yield (oz.)	Profit† (£000)	Tons (000)	Yield (oz.)	Profit† (£000)
Gold Fields										
Doornfontein	115	48,317	272.7	J	1,080	447,097	2430.7	950	386,322	1915.0
Libanon	118	28,781	76.8	J	1,169	281,696	721.4	1,116	263,018	624.5
Rietfontein	12	3,257	1.3	D	48	12,957	5.7	64	16,835	26.9
Robinson	44	9,651	1.1	D	168	38,531	5.3	184	38,550	114.4
Simmer & Jack	69	12,701	10.7	D	278	50,725	10.7	310	54,422	150.0
Sub Nigel	66	15,032	13.0	J	660	150,383	141.6	660	154,445	188.1
Venterspost	125	36,421	90.6	J	1,213	344,663	796.9	1,247	316,702	594.0
Vlakfontein	53	19,607	93.8	D	208	76,392	369.1	205	73,123	346.1
Vogels	81	17,310	13.3	D	324	69,237	58.2	345	73,940	83.6
West Drie	142	126,974	1087.1	J	1,312	1,228,224	10810.9	1,100	1,008,776	8616.3
Anglo American										
Brakpan	142	18,188	22.0	D	567	70,967	76.9	564	68,440	46.6
Daggas	228	46,171	229.4	D	899	181,999	901.0	926	186,647	913.5
East Daggas	108	18,474	41.8	D	428	73,164	169.7	418	70,774	160.9
F. S. Geduld	98	85,601	689.9	S	668	581,584	4739.6	654	561,176	4497.3
President Brand	124	97,341	829.9	S	936	661,453	5753.0	807	659,481	5797.3
President Steyn	110	41,200	165.9	S	748	279,678	1191.7	709	277,895	1267.4
S.A. Lands	108	21,784	50.3	D	418	85,153	200.6	380	79,158	168.2
Springs	94	12,890	16.0	D	372	51,264	60.4	413	57,453	60.1
Vaal Reefs	106	49,321	268.0	D	414	193,775	1051.9	376	169,425	878.8
Welkom	99	32,001	65.5	S	684	216,953	472.3	677	213,501	501.8
Western Holdings	172	118,330	1000.8	S	1,128	772,297	6601.2	1,003	661,987	5451.0
West. Reefs. Ex.	154	44,900	156.3	D	583	169,312	564.0	544	153,080	503.7
Central Mining										
Blyvoor	133	85,785	655.3	J	1,336	866,340	6617.5	1,269	832,727	6313.8
City Deep	111	23,456	2.5	D	449	93,404	16.1	440	92,729	21.2
Cons. M.R.	46	9,870	2.5	J	504	107,065	33.5	848	163,084	68.2
Crown	176	30,546	1.0	D	735	127,567	5.7	801	133,281	14.2
D. Roodepoort	190	35,437	48.4	D	752	138,703	196.4	757	138,576	197.0
East Rand Prop.	231	52,248	59.3	D	926	205,679	237.0	861	219,958	362.2
Harmony	180	73,379	358.9	J	1,720	697,346	3308.9	1,435	573,007	2539.9
Modder East	58	6,382	1.0	J	923	95,191	7.0	1,352	131,974	6.3
Rose Deep	19	3,666	13.9	D	88	16,130	0.2	102	17,077	3.7
J.C.I.*										
Freddies Cons.	65	13,110	131.5	D	249	52,734	1113.3	229	52,212	1179.6
Govt. G.M.A.	38	8,718	14.0	D	176	36,683	115.8	211	43,095	2.0
Randfontein	16	2,894	0.5	D	67	12,246	3.2	90	17,435	12.4
Union Corporation										
East Geduld	125	35,625	215.0	D	505	144,551	880.7	530	156,144	1014.9
Geduld Prop.	75	12,364	19.2	D	310	49,776	87.6	292	53,207	103.2
Grootvlei	212	43,896	211.2	D	852	176,412	861.1	855	178,392	913.5
Marievale	96	23,184	115.9	D	386	93,551	480.8	393	96,301	496.9
St. Helena	180	63,461	403.5	D	710	249,410	1594.4	618	207,060	1266.1
Van Dyk	73	11,597	7.3	D	289	46,012	25.6	285	48,536	40.7
Winkelhaak	93	31,621	167.8	D	372	126,709	685.8	325	100,076	436.6
General Mining										
Buffelsfontein	150	65,923	380.0	J	1,479	622,443	3479.0	1,430	553,915	2891.7
Ellaton	24	5,607	13.5	D	100	23,267	66.9	112	26,556	98.4
S. Roodepoort	29	7,029	22.3	J	295	71,206	225.2	298	71,110	226.4
Stifffontein	177	79,700	426.1	D	694	314,906	1708.0	616	277,330	1433.9
W. Rand Cons.	133	20,397	22.3	D	524	77,584	57.2	506	72,295	13.6
Anglo Transvaal										
Hartebeestfontein	136	62,561	356.4	J	1,250	580,025	3318.3	997	492,945	2969.4
Lorraine	84	22,890	3.0	S	574	138,980	149.0	538	111,652	1146.0
Rand Leases	196	26,166	113.2	J	1,883	264,391	21.8	1,849	277,039	237.2
Village M.R.	36	4,181	1.5	J	312	41,887	129.9	303	46,776	8.7
Virginia O.F.S.	133	26,713	168.3	J	1,238	260,843	1330.6	1,323	299,751	139.6
Others										
N. Kleinfontein	72	10,134	3.0	D	291	40,083	12.7	313	40,699	4.8
Wit Nigel	20	4,270	3.4	J	199	43,654	49.2	187	43,651	52.6

Gold has been valued at 250s. 6d. (March 250s. 4d.) per oz. fine. L indicates loss. † Working Profit. Tables exclude profits from Uranium, Pyrite and Acid, and also production from Uranium divisions at Randfontein and W. Rand Consolidated.

ESTIMATED URANIUM REVENUE

Company	Year ends	April Profit (£000)	This year (cum.) (£000)	Last year (cum.) (£000)	Company	Year ends	April Profit (£000)	This year (cum.) (£000)	Last year (cum.) (£000)
Goldfields					J.C.I.				
Doornfontein	J	16.0	148.5	149.0	E. Champ d'Or (a)	D	4.5*	20.0*	28.2*
Luipards Vlei (a)	J	125.0	1018.2	986.2	Freddies Cons. (b)	D	132.5*	129.5*	121.0*
Vogels	D	56.0	218.5	219.0	Govt. G.M.A. (a)	D	19.0*	86.0*	92.2*
West Drie	J	50.5	493.5	498.0	Randfontein (b) (c)	D	139.9*	552.8*	440.2*
Anglo American					General Mining				
Daggafontein (b)	D	123.5	318.0	563.1	Buffelsfontein (d)	J	132.0	1924.5	2111.0
P. Brand (b)	S	45.2	310.2	326.8	Ellaton (d)	D	2.2†	7.2	70.0
P. Steyn (b)	S	62.0	428.6	428.0	Stifffontein (d)	D	5.5†	103.0	361.0
Vaal Reefs (b)	D	70.0	291.9	575.8	W. R. Cons. (c) (d)	D	163.3	687.0	836.9
Welkom (b)	S	58.8	408.3	408.2	Anglo Transvaal				
West Reefs Ex. (b)	D	48.0	197.6	649.0	Hartebeestfontein (d)	J	230.5	2358.5	2615.6
Central Mining					Lorraine (d)	S	33.0	237.0	249.0
Blyvoor (b)	J	155.0	1568.5	1521.2	Virginia O.F.S. (d)	J	152.1	1687.7	1771.4
Harmony (b)	J	195.4	2287.2	2032.0					

Tables include profit from uranium acid and pyrite before loan redemption. (a) Including profit from gold section. (b) Includes royalty provision. (c) Total profit from uranium section. (d) Excludes royalty provision. * Net revenue. † Uranium royalty received.

MINING FINANCE—Continued

create a reserve of £430,098 against the company's shares in and advances to Canadian prospecting and mining concerns. There is also a transfer of £25,000 to prospecting reserve. The carry-forward is down from £90,415 to £15,924.

At September 30, 1959, the distribution of Western Selection's investments was stated to be Ghana 48.9 per cent, Canada 34.1 per cent, South Africa 6.2 per cent, Nigeria 4 per cent and the U.K., etc 6.8 per cent. With the departure of the Ghana segment—three of the mines were dividend-paying—there may well be some dip in investment income in the current financial year to next September owing to the time lag before re-investment can become revenue-earning. Much, of course, will depend on what form of re-investment the Board has in mind.

Western Selection stand at 5s. If the proposed capital repayment and the net final dividend are deducted the equivalent price would be 3s. 9d. and on this basis the yield would be 10.6 per cent on the 1959-60 distribution.

SIR GEORGE ALBU LOOKS AT WEST RAND

In his annual review the chairman of West Rand Consolidated, Sir George Albu, naturally dwells at this juncture on the changed outlook caused by the revised uranium contract for this Western Rand gold and uranium producer under the general stretch-out arrangement reached earlier this year between South Africa and the U.K. and U.S. purchasing authorities. West Rand ranks as the only producer relying primarily on uranium for its revenue which has been selected for a prolongation of its contract until 1970. One of the main reasons for this is that the mine has very substantial reserves of uranium oxide. It is, in fact, anticipated that the tonnage remaining at the end of 1970 will exceed the total that will have been produced up to that date. (See page 591.)

Sir George thus concludes that the company should "be very well placed to participate on a substantial scale in any business offering at economic prices after 1970". The seventies mark the decade during which world uranium producers are generally hoping to come into their own, as there are grounds for hoping that by then the chronic over-supply position will have been cured.

Sir George anticipates that the aggregate of West Rand's distributable profits for the next ten years will be slightly higher than the total which would have accrued under the old scheme. But in the shorter view the distributable profits will be a quarter lower in 1961 compared with last year and a half less in 1962 and subsequent years. Even so, the conclusion can hardly be drawn that the revised uranium contract is other than a highly satisfactory arrangement for West Rand especially as it gives the mine a chance to live and breathe in guaranteed profit conditions during a decade that, despite the present apparent unlikelihood, could also see a rise in the gold price. This would be an event of marked importance for this mine.

In the Kaffir market's political malaise West Rand 10s. shares have sunk back to only 16s. 3d. Intrinsically, with a ten-year life as the minimum prospect, they must be regarded as considerably undervalued at this level.

GEOFFRIES' STRONG CASH POSITION

Sir George Albu is also chairman of the General Exploration Orange Free State company, another member of the General Mining group, but it was Colonel Jack Scott who presided at the meeting in Johannesburg and who pointed out that, although the market value of investments had further fallen from £550,445 to £354,932 between December 31 and April 28 last, Geoffries had maintained a strong liquid position with cash resources amounting to £750,000. Colonel Scott answered criticism from two shareholders about such a large cash balance being held by saying that, owing to the possibility of a second gold mine being eventually warranted underneath the Riebeck section of the Loraine mine, the directors have always deemed it advisable to retain funds in liquid form. In view of Geoffries' entitlement to any such second mine this opinion has been strengthened. Colonel Scott continued, by recent events in South Africa which have made it difficult to raise capital for mining ventures. (See page 592.)

Geoffries' main investment is in Loraine so the company is very much wrapped up in this particular section of the Orange Free State gold field. Geoffries 2s. 6d. shares stand at 2s. 9d. At this level they look a likely gamble for anyone who thinks the Kaffir market is really going to turn one of these days.

PLEA FOR S. AFRICAN COAL PRICE RISE

In his annual review accompanying the report of the South African coal and investment concern, Vereeniging Estates, the chairman, Mr. Tom Coulter, says that the current year has opened satisfactorily for the coal trade in that country and total sales should "at least be on a par with 1960". Mr. Coulter, however, gives two warnings. Costs continue to rise steadily but inexorably so that the mining companies' profit margins are being eroded away. An upward revision of the government controlled inland selling price is thus necessary, otherwise the proffered reward will not warrant the industry expanding and investing new capital. (See page 590.)

Secondly, also on the subject of new capital, Mr. Coulter refers to the difficulties of raising funds overseas in the Union's present political plight. Vereeniging's substantial investments, which will from time to time need the injection of fresh capital, therefore require the company to retain a sound degree of liquidity, especially as a large percentage of its issued stock is held outside South Africa. Vereeniging £1 stock units are 76s. 3d. The yield before allowing for double tax relief is 11.1 per cent.

The 1961 Leipzig Spring Fair has beaten all previous records in respect of international participation and volume of turnover. According to a communiqué issued by the Foreign Trade Ministry GDR trading companies secured business totalling 4,718,000,000 marks worth of goods 11.5 per cent more than at the 1960 Spring Fair.

Publications Received

International Tin Council Statistical Year Book 1960 and Statistical Bulletin, January, 1961.

International Tin Research Council Annual Report for 1960.

The year book is the second to be published by the I.T.C. Besides statistics, articles are included on the operation of the International Tin Agreement, the world tin position 1946-59 and there are detailed regional notes on the tin and tin-plate industries. Although most of the tables cover a 10-year period up to 1958 or 1959, Russian statistics have been excluded from all world tables since 1940.

The latest issue of the statistical bulletin has been revised and expanded. In addition to a new table on the recovery of tin from scrap in the U.S.A., tin metal exports now include returns from Federal Germany. The regional breakdown of tin imports has been widened; yearly figures of stocks of tin are included; separate tables of tin plate and tin alloy exports have been given for Japan and the Netherlands, and the regional distribution of imports of tin-plate and tin alloys has also been expanded, while statistics of trade in solder and babbitt and white metal have been collated under the one heading of trade in alloys.

The Tin Research Council's annual report draws attention to a number of new lines of research work: the use of tin as a deliberate addition to steel and also in cast iron; aluminium-tin bearings; studies on tin-titanium-oxygen and tin-titanium alloys; the structure of electro-deposited alloys; bright electrotin deposits; the reactivity of surface zones in steel strip used for tinplate; the influence of tin on the hardness of silver and discoveries in the field of organotin chemistry.

The three-volume *Minerals Yearbook* Volume 1 of which is now ready antedates the U.S. Bureau of Mines, which currently celebrates its 50th anniversary year, since the Yearbook appeared originally in 1867 as "Reports upon the Mineral Resources of the United States". The present volume, covering Metals and Minerals (except fuels) for the year 1959, includes a chapter reviewing the mineral industries, a statistical summary, chapters on mining and metallurgical technology and allied subjects and a new chapter on technological trends. It is obtainable from the U.S. Government Printing Office, Washington 25 D.C., price \$4.50.

The 1961 edition of *The Engineer Buyers Guide* is now available containing 1,860 names and addresses of firms representing all branches of industry, classified under 2,700 headings, with 1,600 cross references. Addresses and other details of all firms mentioned are given. It is obtainable from *The Engineer* price 10s. (plus 2s. postage).

The Northern Rhodesian Copperbelt and the allied deposits of the Katanga form one of the world's greatest metallogenic provinces. At the present time the Copperbelt produces approximately 18 per cent of the free world's copper.

The Geology of the Northern Rhodesian Copperbelt, edited by Dr. F.

Mendelsohn, provides detailed descriptions of the Copperbelt's individual deposits, while taking in addition the broader approach that includes structure, metamorphism, ore genesis, exploration and like considerations. There are included a number of contributions from several geologists, the whole thus providing an authoritative work.

Published by Macdonald and Co. (Publishers) Ltd. at 84s. net.

The Federation of Malaya Geological Survey has published, as District Memoir No. 9 *The Geology and Mineral Resources of the Kinta Valley, Perak*, 347 pages with coloured geological maps and sections, and text-figures in an attached pocket. The authors, Dr. F. T. Ingham and Mr. E. F. Bradford have selected for this study an area which includes the richest tin-field at present known in the world. The work was reviewed in an article entitled the "Mineral Resources of the Kinta Valley" which was published in *The Mining Journal* on November 18, 1960.

The Memoir provides much useful information of an historical and statistical character, besides indicating the future prospects for mining in this part of Malaya. This book is published by and obtainable from Geological Survey Headquarters, P.O. Box 1015, Ipoh, Malaya, Price \$10 (Malayan).

Northern Rhodesia Ministry of Labour and Mines have now published their *Record of the Geological Survey* for the year ending December 31, 1959, price £1 1s. Its contents include articles on the regional geology of the Petauke, Mumbwa, Lusaka and Choma Districts.

In the half-century that has passed since the U.S. Bureau of Mines was established in July 1910, the research and technological investigations conducted by the Bureau's scientists, engineers and other personnel have helped significantly in improving health and safety in the mineral industries, and have contributed substantially in conserving the U.S. mineral resources through improved techniques in the mining, treatment and use of mineral commodities. As its studies are completed, the Bureau makes public its findings promptly.

In this year of its 50th anniversary, the Bureau has issued a *List of Publications issued by the Bureau of Mines* from July 1, 1910 to January 1, 1960, with subject and author index; also included are certain reports of Bureau findings published by other organizations and schedules, which are printed in the Federal Register. The items are presented chronologically within each class or series of reports, and include discontinued series and reports which are now out of print, but may be still available from various libraries. This List of Publications, 826 pages, compiled by H. J. Stratton, is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25 D.C., price \$4.25 (paper).

THE VEREENIGING ESTATES LIMITED

(Incorporated in the Union of South Africa)

COAL SALES SHOULD BE MAINTAINED

MR. T. COULTER'S REVIEW

The following is from the review by the chairman, **Mr. T. Coulter**, which has been circulated with the annual report and accounts:—

These results are in respect of the company's own accounts before consolidation, and figures for the previous financial year are given in parentheses.

Gross revenue for the year amounted to £1,489,933 (£1,450,688). Expenses, including directors' fees, depreciation, sundry writings off and provision for taxation, totalled £84,412 (£62,999) and after deduction thereof the net profit was £1,405,521 (£1,387,689).

Sales of blocks of land created a book surplus of £32,168 and after adding the balance of unappropriated profit brought forward £385,133 (£266,194), the total to be dealt with was £1,822,822 (£1,653,883).

The appropriation to general reserve was £250,000 (£100,000) while dividends for 1960 remained unchanged at 8s. 6d. per stock unit and absorbed £1,168,750, leaving an unappropriated balance of £404,072 (£385,133) to be carried forward.

Fixed assets totalling £9,755,615 (£9,700,323) are virtually unchanged with a slight addition to the book cost of sundry quoted investments which now stand at £1,434,278 as compared with £1,391,292 at the close of the previous financial year. Current assets amount to £1,790,820 (£1,590,048) and exceed current liabilities by £1,002,028 (£792,813).

Coal Industry

During the first month of the year under review the Union's coal industry suffered the worst disaster in its history when 437 miners were killed through a roof collapse over a large area in Coalbrook North Colliery, Orange Free State. This colliery supplied the coal requirements of the Taabos pithead power station of the Electricity Supply Commission, and the consequent permanent closing down of the pit threatened to cause a serious power shortage over the whole of the Transvaal and Orange Free State complex of the Electricity Supply Commission system. However the threatened reduction in power output was promptly averted by the despatch of coal from other mines in the Transvaal and Orange Free State.

The total output of coal in the Union of South Africa for 1960 was 41,961,520 sales tons an increase of 2,768,249 tons on the previous year.

Colliery companies subsidiary to and associated with your company contributed 14,390,059 tons, equal to 34.3 per cent of the above total, being an increase of 690,775 tons compared with 1959. Much of that additional tonnage was due to the temporary readjustments of power station coal demands for the reason already given.

Export business for the year was at an improved level. Every effort is being made to improve on these results, but competition is severe in the export market where most coal producing countries have surpluses which they are strenuously endeavouring to reduce.

The current year has opened satisfactorily for the coal trade in the inland

market and provided the country suffers no disruptions to affect its general economy, total sales should at least be on a par with 1960.

With the industry operating on a controlled inland selling price, and with costs continuing to rise steadily but inexorably, the margin of profit available to the mining companies continues to be eroded away. The upward revision of the pithead price of coal will of necessity have to be sanctioned by the authorities in the not too distant future, otherwise the proffered reward will not warrant the industry committing itself to further expansion and investing new capital.

Coke and Coking Coal

Vryheid Coronation Limited, a subsidiary of The Coronation Collieries Limited, represents your company's interest in the coke trade and is the largest producer of metallurgical coke for sale in the Union.

Sales of coke throughout the industry for 1960, totalled 635,117 tons in the inland market while 17,271 tons of export business was achieved.

Expectations of trade for the current year are set at a slightly higher level and it is also anticipated that at least an equivalent tonnage of export business will be done.

Three colliery companies associated with your company supply blend coking coal from their Transvaal collieries on long-term cost-plus-profit contracts, the principal consumer being Iscor. Sales for 1960 totalled 1,974,003 tons an increase of 204,862 tons when compared with 1959.

Refractories

Your company's interest in the refractories industry is held through the subsidiary, Vereeniging Brick and Tile Company Limited.

Profits for the year under review were particularly encouraging, justifying the company in increasing the dividend of its ordinary share capital from 1s. 4d. per 5s. share to 1s. 6d. in respect of 1960, after augmenting the re-investment in the

business by transfer to reserve of £250,000.

I reported a year ago on the rising demand for certain lines of refractories and the necessity to increase the output capacity in certain departments. It is estimated that the capital expansion programme will involve an expenditure of the order of £1,250,000. This expenditure will in all probability exceed the immediate cash resources of the company and in fact it was thought that it would have already required borrowings at this stage, but improved results of the past year have postponed that necessity for a while.

Your company is in a position to grant the subsidiary whatever temporary loan facilities it will require, the intention being to delay the question of liquidating any such loan by raising further capital until such time as the expansion programme has been completed.

Investment Portfolio

Investments in subsidiary companies remain unchanged at a book cost of £7,470,112. Investments in other companies have increased by £42,986 to £1,434,278.

The market value of investments in subsidiary companies at the end of the year was £15,180,099, a considerable drop from £19,093,769 at the end of 1959. The market value of quoted investments other than trade investments at December 31, 1960, was £1,447,468 (1959—£1,735,631).

The events which caused share values to drop steadily during 1960 are known to all and no purpose would be served by my going over the various factors which have caused South African equities to become so unpopular with the overseas investing public, which has developed a lack of confidence in our future.

While there is this lack of confidence the prospect of raising new money overseas is definitely impaired. This concerns your company vitally as such a large percentage of its stock is held outside the Union. Your company is the holding company of important subsidiaries and has large investments in other associated companies. These companies will from time to time be in need of fresh capital to maintain and further their objectives in the interests of the stockholders. In the present climate it therefore behoves your company to retain a sound degree of liquidity as it may have to rely largely on its own resources for capital needs of some or all of its subsidiaries.

Latin American Free Trade Association

The Latin American Free Trade Association will formally come into existence on June 2—thirty days after the signatories deposited ratification instruments in Montevideo. Only three signatories were required to put the machinery into motion but, on May 2, six countries acted—Argentina, Brazil, Uruguay, Chile, Mexico and Peru. Paraguay did not sign on that date—due, it was understood, to technical reasons—but it is expected to do so very shortly. Under the Association's charter, countries will meet 60 days later—August 2—to institute a conference which will prepare for country-

to-country and collective negotiations. Intensive groundwork is already reported under way with member nations exchanging lists of exportable goods and also lists of goods for which tariff rebates are requested. Experts working on the project are reluctant to state when actual operation is likely to begin but it is assumed this will be late in the current year. They recalled that the goal consists in an eight per cent annual reduction of all sums paid as tariffs from one country to another although each member remains free to apply reductions to suit its best interests.

WEST RAND CONSOLIDATED MINES, LIMITED

(Incorporated in the Union of South Africa)

REVIEW OF OPERATIONS DURING THE YEAR ENDED DECEMBER 31, 1960

CHAIRMAN'S REVIEW

The following is a review dated March 28, 1961, by the Chairman, **Sir George W. Albu, Bart.**, on the operations of the Company for the year ended December 31, 1960:—

The total profit from the year's operations was £2,589,132 and reflected a decrease of £77,741 when compared with the results for the year 1959. The shortfall was almost entirely due to the reduced profit of £99,965 earned from the Gold Section of the mine, consequent upon a decrease of 56,000 tons milled, against which the profit from the Uranium Section showed an improvement of £27,981.

Taxation decreased by £38,289 and Capital Expenditure by £58,003. After providing for dividend distributions at the same rates as for the previous three years there was a deficit for the year of £14,566 which reduced the balance of profits unappropriated to £1,105,308.

The development footage accomplished at 86,500 feet was lower by 21,015 feet than the figure for the previous year, this reduction being made up of 5,163 feet in the Gold Section and 15,852 feet in the Uranium Section. Of the footage sampled in the Gold Section 16,215 feet, or 72.6 per cent, were payable with an average value of 342 inch-dwt., these results reflecting increases of 8 per cent and 48 inch-dwt. compared with those for 1959. In the Uranium Section 16,085 feet, or 85.1 per cent, were payable with values of 2.1 dwt. gold and 49.2 ounces uranium respectively over a reef channel width of 23.6 inches. Compared with 1959 the percentage of payability improved by 5.1 per cent whilst the values reflected a slight improvement. The ore reserves in the Gold Section at 4,579,000 tons with a value of 3.4 dwt. over a stoping width of 49 inches represented a reduction of 180,000 tons with no change in width or value. In the Uranium Section the ore reserves at 3,496,000 tons with values of 0.7 dwt. gold and 21.2 ounces uranium per ton over a stoping width of 34 inches were lower by 51,000 tons, with no change in width or values.

Uranium—New Agreement

In an announcement made by the Company on February 1, 1961, shareholders were advised that arising out of protracted negotiations a new agreement had been concluded with the Atomic Energy Board in terms of which the balance of this Company's selling quota amounting to 2,473 tons would be produced and sold over the 10 years 1961 to 1970 at a fixed price of 70.354/- (£70.354) per lb. f.o.b. Durban instead of over the years 1961 to 1964 on a price related to production costs. In addition your Directors negotiated the transfer to this Company from the Orange Free State Joint Uranium Production Scheme of its right to produce and sell 1,360 tons of uranium oxide over the five years 1961 to 1965. The price receivable for the sale of this tonnage will be 85.669/- (£85.669) per lb. f.o.b. Durban against which a royalty of 59/- per lb. will be payable.

This Company is a primary producer of uranium oxide, and when the Direc-

tors agreed to the arrangements mentioned above they were concerned with the importance of ensuring that production would be maintained on a reasonably large scale in the coming decade, with as little disruption as possible in employment at the mine, to enable the Company to compete in any world market existing after 1970. The course chosen will obviate the necessity of closing the Bird Reef Section of the mine at the end of 1964, which probably would have followed the completion of the old contract. The difficulties of re-opening a section of a mine once closed, and the heavy costs thereof, might well have prevented or hindered re-entry into the field of uranium production at a later date. It is now expected that this Company will be the only existing primary producer in this country in production in 1970.

It is anticipated that, provided there are no material changes in present conditions, the aggregate of the distributable profits for the ten years ending December, 1970, will be slightly higher than the total amount which would have been available had the new arrangements not been made. As a result of the stretch-out of the Company's operations over the longer period, however, it is estimated that the annual profits available for distribution will be reduced in the order of one-quarter in 1961 when compared with 1960, and by one-half in 1962 and subsequent years.

The reserves of uranium oxide in the Bird Reef Series are still very substantial, and it is anticipated that the tonnage remaining in the mine at December 31, 1970, will exceed the total which will have been produced up to that date. The Company should, therefore, be very well placed to participate on a substantial

scale in any business offering at economic prices after 1970.

Other Interests

As a result of the very satisfactory progress of Electrolytic Metal Corporation (Pty) Limited during its first year of production, its Directors have decided to increase the capacity of the plant with a view of doubling the output of electrolytic manganese. It is proposed to finance the cost of these additions by temporary additional loan arrangements and the retention of current profits.

Reference has been made in the Directors' Report to the negotiations with Palmiet Chrome Corporation (Pty) Limited for the establishment by that Company of a plant at West Rand to produce ferro-chrome and allied products. This will be established adjacent to the South Reduction Works at the mine and will include portions of it. Since the year end agreement has been reached whereunder the Company will acquire a 20 per cent interest in the re-organized capital of Palmiet Chrome and will participate in the provision of loan facilities for the establishment of the first plant unit. The total commitment for West Rand is estimated to be approximately £200,000 over a period of about 18 months.

This concludes my review of the Company's operations for the year 1960 and I wish to express the Board's appreciation of the loyal and efficient services rendered by Mr. E. M. Stewart, the Mine Manager, and his staff at the mine, as well as by the technical and secretarial staffs at Head Office.

At the Annual General Meeting of members of the Company held in Johannesburg on May 9, 1961, Mr. J. Scott, who took the Chair in the absence through indisposition of the Chairman Sir George W. Albu, Bart., stated that he had no further information to add to that already given.

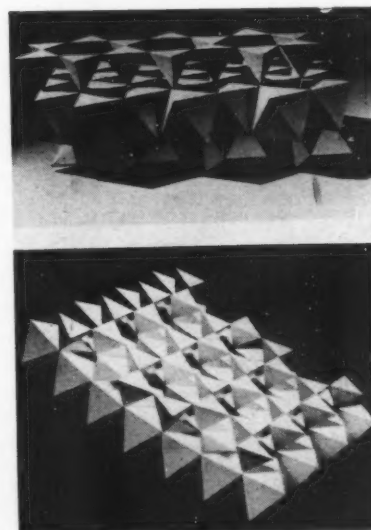
Asbestos the Raw Material

A well illustrated, 30 page booklet called *Asbestos The Raw Material* has just been published by Cape Asbestos Fibres Ltd., a subsidiary of The Cape Asbestos Company Ltd. which was founded in London in 1893.

A brief introductory section is followed by the mineralogical classification of the various types. The central part of the booklet describes the Cape Group's amosite and blue asbestos mines in the Cape Province and the Transvaal. A final section deals with the commercial application of amosite and blue asbestos, gives a note on preparation and fiberization, and a summary of grades.

Photographs appearing herewith are of models of the molecular structure of asbestos and are taken from the booklet. The top model shows how in the structure of amphibole asbestos (blue asbestos and amosite) the molecules fit together to form straight narrow strips—solid rod fibres; whereas those of chrysotile (white) asbestos, below, form a tubular structure—hollow cylinder fibres.

Copies of *Asbestos The Raw Material* can be obtained from the head office of Cape Asbestos Fibres Ltd., at 114 Park Street, London, W.1.



Above, the structure of amphibole asbestos. Below, the structure of chrysotile asbestos

GENERAL EXPLORATION ORANGE FREE STATE LIMITED

(Incorporated in the Union of South Africa)

CHAIRMAN'S SPEECH

Mr. Jack Scott presided at the Fifteenth Annual General Meeting of Stockholders in General Exploration Orange Free State Limited held on May 9, 1961, and in addressing Stockholders said:

This is the Fifteenth Annual General Meeting of your Company, and I have pleasure in submitting for your approval and adoption the Directors' Report and Accounts for the year ended December 31, 1960.

The Accounts reveal that the excess of Income over Expenditure for the year amounted to £13,331 which, added to the amount brought forward from the previous year, made a total of £30,189 available for appropriation at the year end. Of this, £16,210 was appropriated to write off expenditure on the prospecting of areas which had yielded negative results and were therefore abandoned, and £6,373 was absorbed in respect of the loss on investments sold or written down to market value at December 31, 1960. This left a balance of £7,606 which has been carried forward.

Strong Liquid Position Maintained

The market value of Quoted Investments as at December 31, 1960, amounted to £550,445 but the continuing unsettled situation prevailing in this country and elsewhere in Africa caused further deterioration in Stock Exchange conditions since the close of the year and the market value of the Investments as at April 28, 1961, had decreased to £354,932. The Company's strong liquid position, however, has been maintained and its cash resources now amount to R1,500,000 the greater part of which is on fixed deposit.

Letters have been received from two Stockholders criticizing the action of the Directors in maintaining such large cash balances and suggesting that they be converted into shares which at present market prices show very attractive yields as compared with those obtainable on the security of fixed or short call deposits.

As Stockholders are aware the Company's major remaining interest is centred on the possibility of its entitlement to a second mine in the event of a satisfactory mine being found to exist on the Upper Reefs on the previous Riebeeck Lease Area, now owned by Loraine Gold Mines Limited. The Directors have always deemed it advisable to retain the Company's funds in liquid form towards this eventuality and their opinion in this regard has been strengthened in view of the depressed state of financial conditions in this country and the consequential difficulties in the raising of capital for mining ventures.

Interest in Loraine Gold Mines Limited

The investment in the shares of Loraine Gold Mines Limited has been retained, giving your company a direct interest in the progress of that company in its exploitation of the Upper Reefs. Loraine's activities to December 31, 1960, have already been referred to in the Directors' Report. Since that date development on the Elsburg Reefs has been carried out mainly in three separate areas, the main concentration of which is in the No. 3 shaft area, where ventilation facilities are such that stoping tonnage can be made available rapidly. The second most important area starts from about 2,000 feet north of Borehole TV. 2 and continues to the

northern boundary of the old Riebeeck Lease Area. The third area is in the vicinity of Borehole TV. 2 where limited development has been done.

The percentage of Elsburg ore sent to the mill is being increased as rapidly as possible, and is having a marked effect on the recovery grade which has shown progressive increases over the last four months from 4.74 dwt. in January to 5.45 dwt. in April, in which month, for the first time the mine recorded a profit from its gold mining operations.

Development

Development during the first quarter of 1961 amounted to 22,139 feet of which 2,955 feet were sampled, comprising 2,390 feet on Elsburg Reefs and 565 feet on 'B' Reef. Of the footage sampled, 73.1 per cent was found payable at 737 inch dwt. over a channel width of 27.8 inches, the Elsburg Reefs showing payability of 72.6 per cent at 821 inch dwt. over a channel width of 29.8 inches. Development on Basal Reef has now been suspended.

It is interesting to note that development has been carried out on eight separate reefs in the Elsburg series, and it is possible that there may be other reefs of economic interest. Work done to date has proved that the Upper and Lower Elsburg zones are continuous from the northern boundary of the old Riebeeck Lease Area to No. 3 shaft, but until the number of reefs and the extent of their payability on dip is known, it is impossible to assess the total payable tonnage in these reefs.

In conclusion, I wish to record the appreciation of the Board for the services rendered by the Technical and Administrative staff of General Mining and Finance Corporation, Limited, under whose supervision your Company conducts its operations.

The report was adopted.

FOR SALE

Quarry, Ore Dressing Plant and Ceramic Plant with all ancillary equipment including Power Station, Railway and Housing, situated in KENYA.

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DAVIES INVESTMENTS LTD.,
Private Bankers (Gross assets exceed £2,500,000), are paying 7½% p.a. interest on deposits for the eighth year in succession, with extra ¼% added annually on each £500 unit. Details and Audited Balance Sheet from Investment Dpt. MN., Davies Investments Ltd., Danes Inn House, 265 Strand, London, W.C.2.

Personal

Mr. A. W. Baker has been appointed general manager of Chloride Batteries Ltd., from April 3, 1961, in place of Mr. C. Pritchett, in order to release Mr. Pritchett for other duties in technical management within the Chloride Group.

★

The National Coal Board have appointed Mr. T. Wright to be general manager of No. 4 (Aberdare) Area, South-Western Division with effect from April 1, 1961. Mr. Wright had been general manager, No. 5 (Eastwood) Area, East Midlands Division since 1957.

★

Mr. N. A. C. James, Southern England area manager, Cape Insulation and Asbestos Products Ltd., has been appointed controller, Government Contracts Division, with special responsibilities for liaison with the Admiralty, the Fighting Services and British Railways. This is a new post.

★

British Insulated Callender's Cables announce that Mr. J. Varley and Mr. G. H. Parr, refinery manager and sales

manager respectively of British Copper Refiners Ltd. have been appointed directors of that company. British Copper Refiners is a wholly-owned subsidiary of BIOC.

★

Mr. W. Washbourne, who was appointed general manager of the Excavator Division of Newton Chambers and Co. Ltd. at the beginning of this year, has now been appointed a director of two Newton Chambers subsidiary companies—NCK-RAPIER Ltd. and Rhodes and Halmshaw Ltd.

★

The death has occurred in Paris of Mr. M. A. Novomeysky, a pioneer of the development of the Dead Sea mineral region and the founder of the Israel potash industry.

★

Thos. W. Ward Ltd. announce the appointment of Mr. Stanley Jessop as manager of their works at Fore Street, Scotstoun, Glasgow, with effect from April 1, 1961. He will be in charge of the company's engineering interests in Scotland.

